

The Iron Age

A Review of the Hardware and Metal Trades.

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Improved Apparatus for Hoisting and Conveying Freights.

We show in the accompanying illustration an improved apparatus manufactured by the United States Hoisting and Conveying Company, as applied to the loading and unloading of merchandise on wharves. The power for raising and moving the goods is furnished by a 10 horse-power engine on the wharf. The frame to which the cable is attached may be either fixed or movable. That part of the frame extending over the vessel is so arranged that it folds up flush with the side of the wharf, and allows the vessel to be placed as desired. The arrangement of this machine is such that freight of any description is taken from the hold of the vessel, lifted vertically to the machine, thence on the cable to any point over, and lowered down to the wharf, or vice versa. The machine will take its load, hoist, convey, lower, leave it, and return to the starting point in two minutes.

The company have made several modifications of this device, adapting it to the duty of moving coal and ores to and from wharves and mines, to the excavation of side hills and the filling in of valleys, to the loading and unloading of steamers on western rivers, &c. The machinery is automatic in its operation, and moves very quickly and smoothly. The company's offices are at No. 115 Broadway, New York.

"Commissions."

The following pointed and practical article, which we take from the *Journal of the Franklin Institute*, is timely and interesting:

The perversion of the original meaning of the word commission, from authority or power to do something to that of the reward or payment of a fee to the commissioner, is sufficient to indicate the departure from honest dealing, which has grown up with the delegation of the right to purchase in behalf of others. That a man's ability as a broker or trader, or as a professional man, may properly be measured and remunerated by some definite amount, in proportion to the value of his commission (in the correct and original meaning of the word) is unquestionable; and a customary, or agreed upon, poundage or percentage is one of the admitted conditions of commerce and of art; but the private receipt or payment of such poundage or percentage, however frequently or generally accepted, will not be justified by custom, as it is unwarranted by agreement of the person, company or governmental body, that incurs the expenditure.

Still it is well known that the habit exists. The increase of larger manufacturing establishments; the aggregation of capital in manufacturing and railway companies, the expenditures of cities and towns for public improvements, and of government for the same, in time of peace, and of the latter for warlike purposes, in time of war or threatening; all require the large outlay of money, generally to be entrusted to officials, under salaries for the very purpose of making the outlay; the making of such outlay being rarely, in this country at least, under the direction of brokers or professional men, with understood rates in lieu of stipends. The demand on the receipt of a commission under these circumstances becomes an act of dishonesty, and its payment by the merchant, tradesman, manufacturer, engineer or builder, a participation in the wrong; while the whole community may be arranged for connivance in the frauds.

This condition of things is not peculiar to this country alone. One of the last numbers of the *Builder* (London) contains a statement that at a meeting of the Institute of Architects a circular or advertising pamphlet was distributed relating to some of the requirements of house building, in which was placed a separate notice that a commission would be allowed to architects recommending or procuring the use of the article advertised. Attention was

called to the fact, and it was animadverted upon without stint or apology; but the existence of such a proposition, the reluctance to expose the name of the person making it (with an evident compassion for his ignorance, rather than an indignation at his criminality), and the neglect to pursue the subject beyond a disclaimer, leaves a grave suspicion that there may have been instances of acceptance of, and possibly of demand for, commissions, by clerks of works, if not by architects.

It is not too much to assert that both here and in England (supposing that courtesy will permit us to assert ourselves first in the order of merit) there is a popular belief that money is made in this way by higher professional men, as well as by subordinates. It is hard to perceive how some men can live otherwise, and harder yet to comprehend how some work or material is recommended or passed except by some direct interest in the sale or in the final acceptance. The evil permeates all official and business relations, reaching to the limit of all trust or employment. It would be easy here to descend upon the relation of the unpaid or underpaid members of any mu-

nicipal, state, or of the general government, to elected or appointed officials, or the work to be performed under the direction of such officers; or to dilate upon the opportunities for profit, of unpaid directors in companies through employees, or in whatever other ways personal emolument can be attained; but it is sufficient to restrict the present remarks to the proper relationship of advising and purchasing agents to manufacturers and dealers, in regard to commissions.

As a matter of pure business, it is at once admitted that a judicious purchase is of great advantage to any buyer, and that the ability, knowledge or intelligence, which enables one man to effect such a purchase better than another, is a valuable commodity to be paid for. It has come, or is coming to be recognized, that the lowest bidder method of purchase, inevitably fails to secure a satisfactory bargain. The keen purchaser who attempts to get more for a dollar than a dollar's worth, is frequently, and always in the end, outwitted—the covenants to perform become the less effectual as they are made the more binding—the more cunning the stipulation, the more knavish the contractor; and sooner or later, such a buyer finds that he had better have made his purchase in open market, from those who would have gained a profit from the sale and have had a stake in the perpetuation of their trade or manufacture.

On the other hand, the seller finds it for his interest to push his wares, and in so doing he can or will concede a brokerage, consoling himself with the idea that such a "commission"

is not illegal or immoral. In this view he is unquestionably justifiable—with a qualification—that the transaction must not be a private one. The seller, however, has no right to pay for the procurement of an order, or for the acceptance of material or work, any sum of money, which will not be publicly acknowledged and openly paid. Such a payment can only be a bribe to the recipient, and a theft from the principal in the purchase.

As to the engineer or architect, the purchasing agent of whatever degree, the demand for an acceptance of such private fees cannot be characterized by too strong language, or condemned in too open a manner. If professional advisers will take the most decided stand upon these points, and make publicly every offer for commissions they may receive, there will ensue a restoration of popular opinion in their behalf, and, sooner or later, a higher appreciation of the value of technical direction and advice will result.

America as Seen by a Sheffielder.

A gentleman from Sheffield, now in this

country, sends the following letter to the *Sheffield Telegraph*. It will be found to contain—beside the errors—many suggestions of interest and value to people in this country, as well as to those of Sheffield:

Since addressing you in January, the *Telegraph* has arrived containing Dr. Webster's statistics of the total exports of steel, hardware and other goods from Sheffield to the United States for the year 1875. A reduction of £572,000, as compared with 1874, is bad enough, but when you compare it with 1873 and find the difference to be £1,043,100, it is indeed startling. There are a variety of causes for this extraordinary state of affairs. Among them may be stated the depression of every branch of trade, which has extended over the length and breadth of this country; the retrenchment in public and private expenditure, especially in railroad construction, as will be seen from the fact that during 1875 only 1483 miles of road were built, against 7340 miles for the year before the panic; and last, but not least, the fact that American manufacturers are pushing their goods out of the market. Judging from recent editorials, reports and speeches which have appeared in Sheffield papers, it would almost appear as though your townsmen had only just thoroughly woken up to the true condition of their interests. And yet, when it is remembered that so many of your best firms are represented here, they at least must have known through their agents how certain branches of the trade of the town were slipping away. Then, again, some of your best known men in both public and private life have recently been here, and

they could not but observe the rapid march of progress and development which is steadily and surely going on. Yet, with all this, you jump up in frightful alarm, and send the president of the Chamber of Commerce before the town with a speech which does not strike at the root of the matter, but which gets very severely handled here, and certainly cannot do much, if any, good to the cause of Sheffield trade; in fact, it has already sown seeds here which will spring up and bear fruit of a most unsatisfactory kind.

That a portion of your trade has gone for ever cannot be denied. That you have lost the Bessemer steel rail business is, I am afraid, also true, unless prices can be cut down at home, or else go up here, and the former seems to be unlikely, for the dearth of coal would of itself be sure to maintain high figures. But, notwithstanding this, Sheffield has by no means lost other branches of her trade, as is well known by some houses in this town, who very wisely say nothing about it.

The fact of exporting £354,000 worth of steel, and £180,000 worth of cutlery during one, if not the worst year ever known in the history of

the shareholders for a while longer, until some lucky one happens to pop in just at the right time.

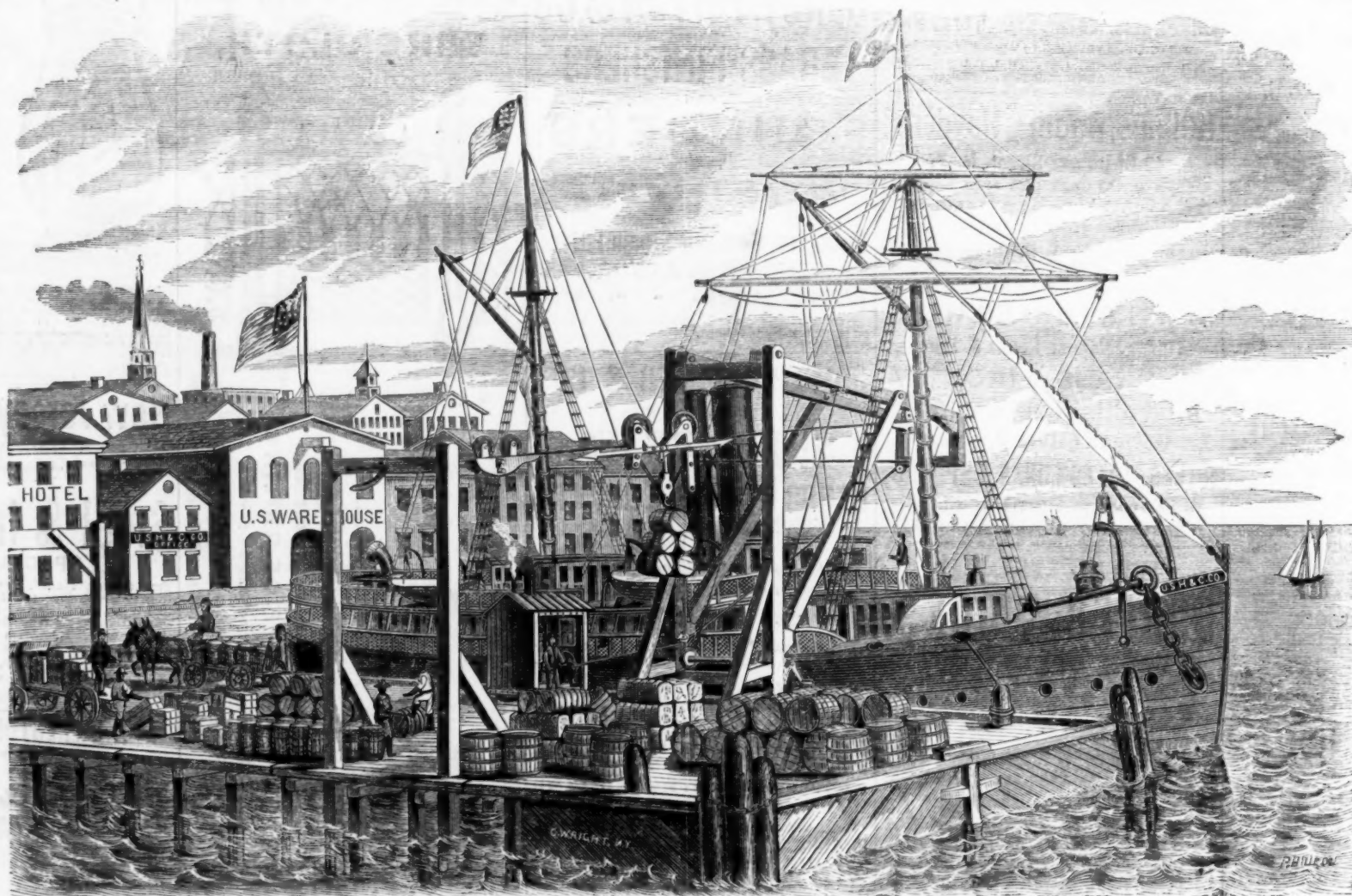
The leaders of trades unions are alive to the times. Next to the rates of wages they have directed their attention to the question of apprenticeships, and invariably with the one idea of limiting the number of apprentices in their respective trades to the lowest possible figures. The consequence is, that in some trades in which the unions are strong the number of apprentices is limited to one for every 25 journeymen, and in scores of trades one to nine and one to seven are the rules. Hence hundreds of boys drift into the over-crowded ranks of unskilled labor, while others run into seed and idleness. In Pennsylvania this evil is already beginning to attract attention, and it will not be long before each manufacturing State sees it. In 37,200 mechanical and other establishments in the above named State only one minor was employed to 15 adults, which gives one boy contributing to his own or others' support to every five families; of 80,760 persons employed in mining operations, 9846 only were minors, or one boy to nine men; in some other

branches of trade the disproportion was still more startling. In this one State alone there are 150,000 boys waiting an opportunity to learn some useful trade. In consequence of the extent to which machinery is used here, of course labor is very much reduced, and such a large division and distribution of work quite unnecessary. A smaller quantity of labor is only requisite, so that even should the price of labor rise very considerably, yet the great diminution of the quantity will generally more than compensate the greatest rise which can happen in price. Then, again, the American has more application, and most certainly more steadiness of character. He does not work three or four days in the week and devote the remainder of his time to drink, gambling, rabbit coursing, pigeon shooting, and other less respectable pursuits, but goes on steadily. Do not think I include all workmen of Sheffield in the class described, because I am fully aware there are some of whom the town is proud, but, on the whole, I do not hesitate to give a verdict in favor of those here.

In conclusion, allow me to urge upon the workmen of Sheffield that if they wish their town to retain that pre-eminence which it has

so long enjoyed, they must remember that there is another country able to produce steel, steel and iron rails, files, saws, skates, tools, agricultural implements, and cutlery of such quality and workmanship as is good enough for home consumption, and some fine day may find its way into Australia, India, South America and elsewhere, as slowly but surely it is doing into Canada.

A method of extinguishing fires on board ship has been submitted to the Russian Admiralty. Two receptacles hermetically sealed, and containing anhydrous bicarbonate of soda, are to be placed in the fore-castle of the vessel, with two retorts containing sulphuric acid connected to them by a siphon, but closed by means of stop cocks. In case of fire breaking out, the cocks are to be opened, when the mixture of the two substances will generate carbonic acid, to be led through pipes provided for the purpose into the hold, and thus extinguish the fire. The commission charged with examining into this method reported against it on account of the danger to the crew in case of breakage or leakage of the tubes, and also the fact that carbonic acid being heavier than air, it would be difficult to free the vessel from it. *Rivista Marittima* considers, however, that this plan might be adopted with advantage in the powder magazine and in portions of the vessel which are isolated from the rest; beside this, substances much more dangerous are stored on board vessels than carbonic acid, which might be the means of preventing an explosion and the loss of everything



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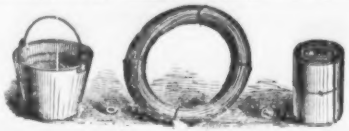
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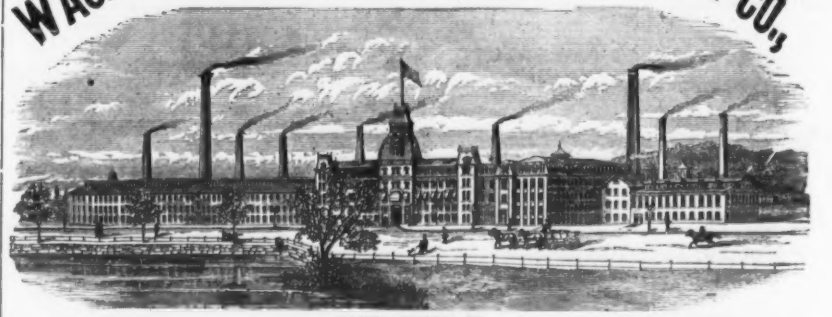
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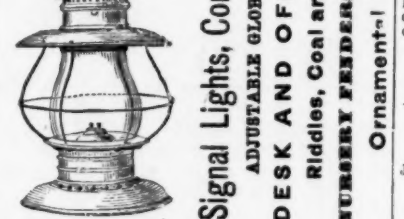
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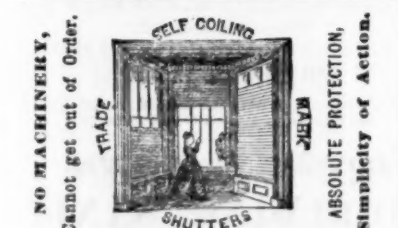
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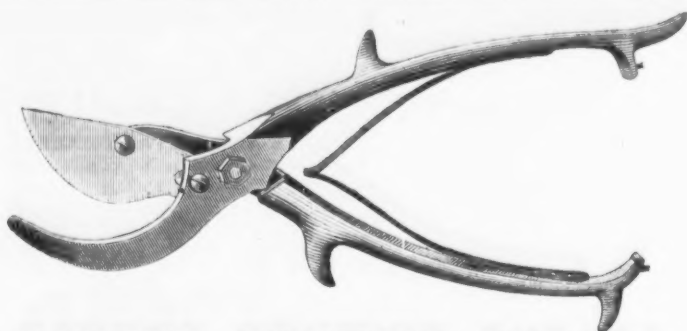


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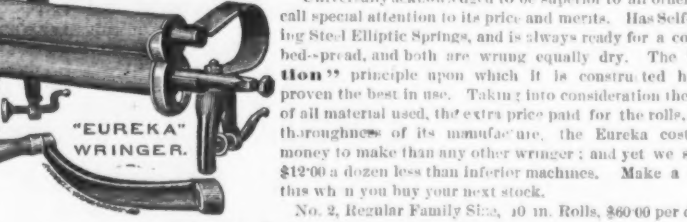


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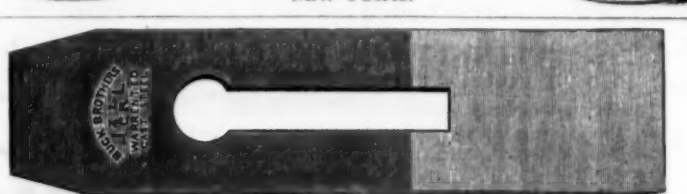


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The Underground Telegraphs of London.

At a recent meeting of the Society of Telegraphic Engineers, an interesting paper on "Underground Telegraphs; the London Street Work," by Charles Fleetwood, of the Postal Telegraph Department, was read. The author stated that from the original five wires used by Cook & Wheatstone, in July, 1837, between Euston and Camden, to test the success of the original five-needle telegraph, the system has gone on increasing latterly with rapid strides, culminating at the present time with 750 different wires entering the central station, and a total mileage of 3500 miles of gutta-percha covered wire. On the successful issue of the Cooke & Wheatstone telegraph, it was started commercially; and a line of five wires was placed underground in lead pipes between Peddington and Drayton. This line became defective, and in 1841 was replaced by posts and overhead wires. The existing lines erected by Mr. Cooke from this period were, in 1846, on the incorporation of the Electric Telegraph Company, led by wires in iron pipes to the first office in London, 345 Strand. In the following year the system was extended under the streets to their new Central Station, at Founder's Court, Louthbury, which office was opened January 1st, 1848, when the total system of the company at that time reached 1500 miles of telegraph wire erected and in progress, a mileage less than one-half the present system under the streets of London alone. The wires were formed into cables and drawn through iron pipes; the wires were of No. 4 gauge. These cables were connected to what were termed testing posts, standing up like a street post. The wires were connected in these boxes by a mechanical joint, which it was easy to open and disconnect for testing.

At the present time the street work of London consists of about 3500 miles of No. 7 gauge gutta-percha covered wire, wrapped with tape and tarred, drawn into cast iron pipes of 3 inches, and, in some cases, 4 inches diameter. This system connects the central office, at St. Martin's-le-Grand, with the several provincial railways and the main road lines of telegraphs; it also serves a large number of the metropolitan telegraph offices. After describing the main routes of the pipes through the various districts of London for a length of 110 miles, the author went on to state that at the new general post-office the whole of the 740 wires are carried up the interior of the building and terminate on a test box, where each wire is numbered. Provision has been made on this box for 500 wires from the west, and a corresponding number from the east, a total of 1000 in all. A 4 inch pipe will hold 120 wires of No. 7 gauge prepared, and a 3 inch pipe 72 wires; but it is not well, unless compelled by circumstances, to draw in those numbers. The pipes are 9 feet long, and previously to being laid, are well cleansed inside by having a heavy chain or manilla drawn to and fro to rub off any superfluous substance left in casting. The socket joints are packed with tarred yarn and lead run in, as in the case of gas or water pipe joints.

In marking out the route, the footpath is generally chosen, and the pipes are laid under the pavement, it being more accessible, especially since the asphalt has been introduced. Flush boxes 2 feet 6 inches long, 11 inches wide, and 1 foot deep, are fixed, in some cases 50 yards apart, and in others 100 yards, according to the number of wires required, and the nature of the streets. A No. 8 galvanized iron wire is threaded through the pipes from box to box, as the pipes are laid, by which the cables are hauled through. All the cables are sent out from the postal stores in lengths of 400 yards. On arrival at the place where they are to be used, the cable is coiled in a loop, a short distance from the center flush box of the 400 yards length. The ends of the wire are trimmed for about 6 inches. The cable is then divided into two, and each portion being twisted, is then passed through the loop in the iron leading-in wire in contrary directions, beaten back and secured. A piece of canvas is then wrapped round and fastened with string. An iron frame with wooden rollers is then fixed in the flush box. The cable is made to pass over one roller and under the other, and the latter is so arranged that the cable enters the pipe with a clear lead, and without being chafed against its edges. All being now ready for the drawing in, two men stand within the coil cutting the ties, and delivering the cable to a third man over the flush box, whose duty it is to see that the cable enters the pipe evenly, the foreman standing near, so as to watch the cable entering the pipe, and to signal to the men at the next box when to commence or cease pulling. When the first 50 yards of cable have entered the pipe, which is known by the end appearing at the next box, a piece of tape is tied round the cable; and when this has passed through the pipe, a second piece, and so on, till the 200 yards have been drawn through. As the cable comes out of the pipe, it is coiled on the opposite end to that from which it has been drawn; the cable is then turned over by being recoiled on to the contrary end of the box ready again to enter the pipe. This operation is repeated till the 200 yards have been laid. A corresponding operation has to be performed with the remaining 200 yards of the cable, but, of course, in the opposite direction. As soon as a few sections of the cable have been laid, the jointers follow, starting from the Central Station, St. Martin's-le-Grand, and joining the wires in the vaults under the pavement at the corner of Bath street, Newgate street, to the house wires leading from the test box in the instrument room, and which pass through a rack numbered to correspond with the terminals on the test box. Having completed the joints at that spot, one man proceeds to the next joint box, 400 yards distant, and the other to the test box, where he commences numbering the wires by putting the current on the lowest number through a gal-

vanometer, and when found by the man in the flush box, three signals are passed twice each way. The wire is then fitted with a small piece of composite tube, on which a number has been stamped corresponding with the test box number. Every wire is numbered in this way at the 400 yards boxes, so that at every joint box the number of any wire is at once known. The men engaged in this work in London have had great experience, and although the whole of their joints will not, perhaps, to use their own phrase, "stand the shadow test" (Thomson's Reflecting Galvanometer), they are generally good. The greatest enemy they have to contend with is dirt, and although full instructions are issued, and every care taken, it is difficult to carry them out thoroughly in the streets of London. There have been several methods proposed for improving the joints in the streets, but as yet they have met little favor from those engaged in the work. It has been the custom to make a twist joint, and now it has been suggested to insert the ends after being cleaned, into a piece of slit copper tube, lined on the inside, of about 3/4 inch in length, after which it is soldered. This makes a good joint, and, it is believed, will prove beneficial, as it does away with the sharp points that must be left when a twist is made. A plan for insulating joints is on trial at several places. The two wires are passed through the wooden bottom of a short tin tube, the twist made and soldered, and then the wires pulled back into the tube, and the latter filled with melted paraffine wax. Such a system of mechanical jointing, of course, could not be used where it would be necessary to draw the joints through a pipe.

On the subject of maintenance, the author stated that within the past five years nearly the whole of the underground system in London has been relaid, the number of wires having been found insufficient to meet the increased metropolitan traffic, as well as the additional wires rendered necessary on the railways and road lines for the rapidly developing provincial business. This work has been effected with comparatively little or no interruption of the working circuits, and by far less than is experienced from renewals on railways or road lines.

The underground wires are tested periodically from the Central Station by means of a Wheatstone bridge and Thomson's galvanometer. To prevent stopping the circuit, two spare wires (where available) are used between St. Martin's and the point to which the tests are to be taken: one joined to an instrument for a speaking circuit, and the second as a substitute for the working wire during the time it is being tested. * * * During the latter portion of the time that the old building in Telegraph street was in use, it frequently happened that a wire was worked out of a mass where there was nothing to identify it by. In that case, rather than prick the wires, a wire-finder, such as mentioned by Mr. Culley, in his "Handbook of Practical Telegraphy," was used, but it was found to be a difficult task, owing to the currents in the working wires affecting the needle. Eventually it struck the author, that if he used a quantity current, and the horizontal galvanometer, generally used for the Wheatstone bridge, he should succeed. It proved to be correct; the quantity current only moving the needle. This plan has since been used in the street, and answers admirably. In conclusion, the author expressed a hope that he might see the underground system extended far beyond the outskirts of London, believing that if the same care and attention were given to it as is given to submarine cables, it would prove to be a great success.

Parson's Manganese Bronze.—A new variety of bronze, containing manganese, is just being introduced by Parson's White Brass Co. It is stated to be very valuable for all kinds of small work wherein gun metal is now used, and it is capable of being forged like iron. Specimens have been tested at the Royal Arsenal, Woolwich, by Colonel Younghusband, with the following results:

	Tons per sq. in.	Ratio of Elastic to ultimate	Elongation per cent.
No. 1....14.0	21.3	57.6	5.25
No. 1a....12.6	35.0	43.4	31.80
No. 2....14.0	22.1	63.3	5.50
No. 2a....13.2	28.8	45.8	35.35
No. 3....16.8	33.6	71.1	3.80
No. 3a....13.0	30.3	39.6	30.75

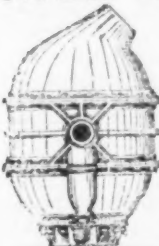
Nos. 1, 2 and 3 were cast in iron molds, and Nos. 1a, 2a and 3a were forged from the same castings. No. 2 had slight flaws in it. The hardness increases as the numbers rise, No. 3 being about as hard as our bronze coinage. The sectional area of the test pieces was .538 square inch and their length 2 inches.
Cobwebs have been applied to various uses. The delicate cross hairs in the telescopes of surveying instruments are fine webs taken from spiders of species that are specially selected for their production of an excellent quality of this material. The spider, when caught, is made to spin his thread by tossing him from hand to hand, in case he is indisposed to furnish the article. The end is attached to a piece of wire which is doubled into parallel lengths, the distance apart exceeding a little the diameter of the instrument. As the spider hangs and descends from this, the web is wound upon it by turning the wire around. The coils are then gummed to the wire and kept for use as required. About a century ago, Ros or Langue-doc, succeeded in making a pair of gloves and a pair of stockings from the thread of a spider. They were very strong, and of a beautiful gray color. Other attempts of the same kind have been made; but Reaumur has stated that the web of the spider was not equal to that of the silkworm, either in strength or lustre. The cocoons of the latter weigh from three to four grains, so that 2000 worms produce a pound of silk; but the bags of the spider, when cleaned, do not weigh above the third part of a grain.

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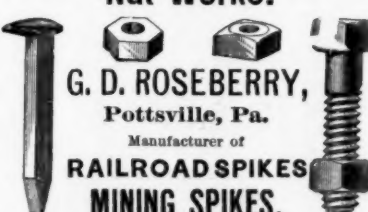
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New Patents.

We take from the records of the Patent Office
of Washington the following specifications of
certain patents, lately issued, which will be
found interesting:

IMPROVEMENT IN GAS FURNACES.

Specification forming part of Letters Patent
No. 171,162, dated December 14, 1875, issued to
Alexander Parkes, of Gravelly Hill, Erdington,
England.

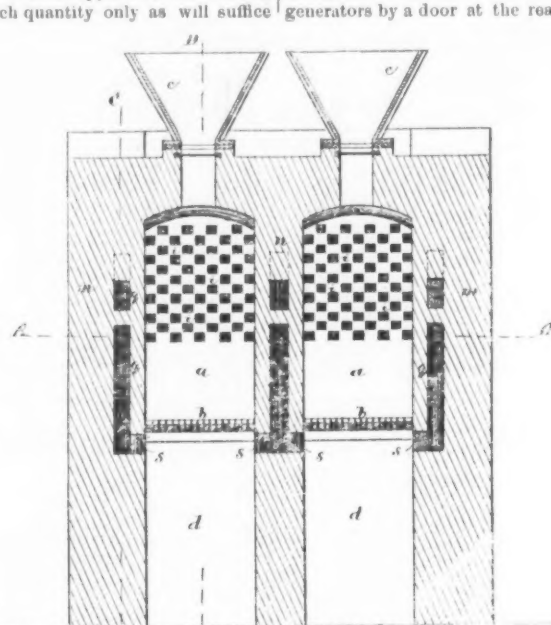
This invention consists of the improvement
in furnaces used in metallurgical operations—
such, for example, as muffles, smelting, calcin-
ing and puddling furnaces, but are also appli-
cable to steam boiler and other furnaces.

The following is a description of the inven-
tion in its application to a furnace for smelting
copper. The chamber or generator into which
the fuel is charged, and in which the gaseous fuel
is produced, is provided with inclined bars at
bottom, which may be tubular, and their inner
ends open into the hollow bridge or combus-
tion chamber. Through the bars at the bottom
of the generator air is supplied to the burning
fuel, but in such quantity only as will suffice

Figure 1 represents a transverse vertical
section, and Fig. 2 a longitudinal vertical
section, of a furnace to be applied to the smelt-
ing of copper, the puddling or melting of iron
or steel, and to other like metallurgical opera-
tions; and also to the heating of steam boil-
ers, the said furnace being constructed accord-
ing to my invention.

The same letters of reference indicate the
same parts in the several figures of the
drawing.

The furnace represented is provided with
two chambers or gas generators, marked *a a*,
placed side by side; but one or more than two
generators may be employed for each furnace.
Into the said generators *a a* the solid fuel is
delivered in such quantity only as to fill half
the fuel space of the generator; and in the
said generator the gaseous fuel, consisting
mainly of carbonic oxide, is produced. The
fuel supplied to the generators rests upon the
inclined fire bars *b b* at the bottom thereof; and
fuel is supplied to the generators by the hop-
pers *c c*, situated over the arched tops of the
said generators; or the fuel may be fed to the
generators by a door at the rear side thereof,



IMPROVED GAS FURNACE.—Fig. 1.

to maintain a low combustion, and give rise to
the formation of a gaseous fuel, consisting
essentially of carbonic oxide. The rear side of
the generator is inclined, and the door or hop-
per through which the said generator is charged
is at the top and over the inclined rear side of
the said generator. The gaseous fuel produced
passes from the generator at the side opposite
to the inclined rear side described. Two or
more of the said generators are employed side
by side, their gaseous products passing over a
bridge common to them both into the reverber-
atory chamber. The bridge referred to is hol-
low, and constitutes a hot air flue, up which a
current of air rises. This hot air mixes with
the gaseous fuel from the generators, thereby
effecting its combustion, and producing an in-
tense heat in the reverberatory chamber. The
walls of the generator are reticulated or honey
combed, and the air passing up the hollow
bridge is heated by passing through the reticu-
lations in the said walls. In advance of the
reverberatory chamber, in which the smelt-
ing of copper, the puddling of iron, or such
other metallurgical process is conducted as
requires a reverberatory furnace, a second
chamber is situated, and separated from the

in a manner similar to that by which the fuel
is fed to ordinary furnaces. *d d* are the ash
pits. A limited quantity of air (regulated by
doors, slides, or dampers) is supplied from
the ash pits *d d* to the gas generators *a a*
through the fire bars *b b*, for maintaining in
the generators a low combustion, and the pro-
duction of gaseous fuel, as is well understood.
The rear wall or side *p* of each chamber or gen-
erator *a* is inclined, as seen in Fig. 2. In the
said rear wall of the generators are eight holes
e e, through which the state of the furnace may
be ascertained.

The gaseous fuel from the generators *a a*
passes over or through a double or hollow
bridge, marked *f g*, the space *h* between the
double bridge constituting a hot air flue, up
which hot air rises, and, mixing with the gas-
eous fuel, causes its combustion.

The wall *f* of the hot air flue or combustion
chamber *h* is perforated with a series of rec-
tangular openings, *i i*, through which the gas-
eous fuel from the generators *a a* passes into
the hot air flue or combustion chamber *h*, the
flame, and heated air, and products of combus-
tion from which chamber *h* pass, by the perfo-
rations at *k* in the other wall *g*, into the pas-

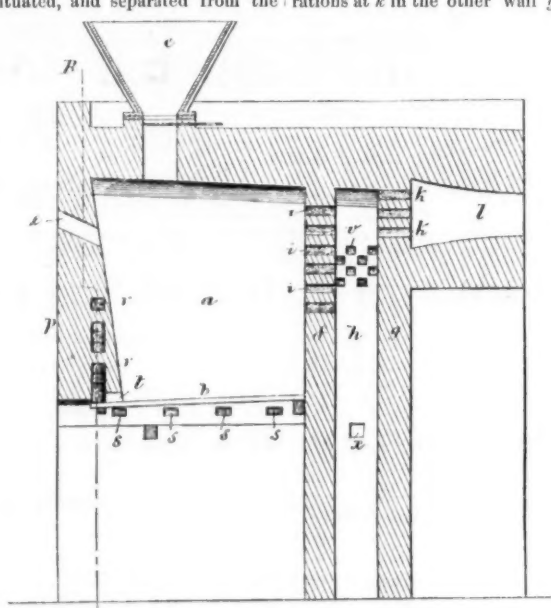


Fig. 2.

furnace by a bridge. The flame and heated air
from the reverberatory chamber pass into this
second chamber, which is sufficiently heated
thereby for conducting the process called
cementation, or other metallurgical process,
such as the distillation of zinc, requiring a
less intense heat than that of the first or
smelting chamber. The flame and heated air
passing from the second or cementation cham-
ber may pass to a Cornish or flue boiler, or
other boiler, and by being made to circulate in
and about the said boiler may be utilized for
the production of steam.

In order to render the steam boiler inde-
pendent of the metallurgical furnace it may
be provided with a small separate generator,
of the kind described, which can be used for
raising steam when the metallurgical furnace
is not at work. The generator and hot air re-
ticulations and bridge may be applied to steam
boiler and other furnaces directly—that is, in-
dependently of a metallurgical furnace.

By the combustion of the gaseous fuel in the
hot air flue or chamber *h* an intense heat re-
sults, and the chamber, in connection with the
furnace, is highly heated.
The manner in which the air for effecting
the combustion of the gaseous fuel in the hot
air flue or chamber *h* is conveyed to the said
chamber, and heated in its passage thereto,
is as follows: The walls of the generators *a a*

are heated by the production of the gaseous
fuel, and these heated walls are made use of
to heat the air for mixing with the gaseous
fuel formed in the said generators. The side
walls *m m* and the middle wall *n*, between the
two generators, are reticulated or honey combed,
and the rear wall *p* is also reticulated. These
reticulations constitute tortuous ascending
channels, through which the air passes, and is
heated thereby.

The hot air channels in the side and middle
walls *m m n* are marked *q*. The channels or
passages in the rear wall *p* are marked *r r*.

Air from the ash pits *d d* enters the ascending
channels *q q* by the horizontal passages *s s*,
opening into the ash pits, and, similarly, air
enters the rear ascending channels *r r* by the hori-
zontal passages *t t*, just above the fire bars, as
seen in Fig. 2. The air traversing the end pas-
sages *r r* enters by passages into the upper part
of the side passages *q q*, and the air heated by
its passage through the reticulations *q q r r* en-
ters the hot air flue or combustion chamber *h*
by perforations at *v* in the walls of the said flue
or chamber *h*.

The heated air from the side passages *q q*
enters the hot air flue *h* at opposite ends, and
the heated air from the middle passages *q q* en-
ters the hot air flue at the middle thereof.
When the fire bars of the combustion chamber
are tubular, their inner ends are made to project
into the combustion chamber *h*. The air pass-
ing through these tubular bars is heated there-
by, and enters the chamber *h*, and mixes with
and effects the combustion of the gaseous fuel.

Instead of heating the air supplied to the
hot air flue or combustion chamber *h*, air may
pass directly from the outside of the generators
a a by the lateral passages *x x*, into the said flue
or combustion chamber *h*.

In order to increase the heat of the air sup-
plied to the hot air flue or combustion cham-
ber *h*, when the furnace is used in connection
with a puddling chamber, or other chamber
where an intense heat is required, each of the
gas generators *a a* is provided with a double
arch, the space between the double arch, form-
ing a flue, through which the air, which has
been heated by passing through the end ascend-
ing channels *r r*, is conducted, and is thereby
further heated before it enters the hot air flue
h.

Claim—1. The combination of the generator or
generators, in which the gaseous fuel is formed,
with the hollow bridge *f g h*, forming one side
of the generator or generators, and constituting
a hot air flue or combustion chamber, in
which the air is mixed with the gaseous fuel,
and the combustion of the gaseous fuel is
effected.

2. In combination with the generator or gen-
erators and hot air flue or combustion chamber
f h g, arranged for operation as described, the
reticulated flues or channels in the walls of the
generator or generators, for heating the air to
be mixed with the gaseous fuel in the hot air
flue or combustion chamber.

3. In combination with the generator or gen-
erators and hot air flue or combustion chamber
f h g, forming one side of the said generator or
generators, as described, the flues in the walls
of the generator or generators, and the arched
flues above the said generator or generators,
for increasing the heat of the air supplied to
the hot air flue or combustion chamber.

IMPROVEMENT IN PROCESSES OF CONVERTING
CAST IRON INTO STEEL.

Specifications forming part of Letters
Patent No. 170,173, dated November 23, 1875,
issued to Charles L. Jeffords, of Jamestown,
N. Y.

This invention relates to a process for manu-
facturing edge tools and other implements
from ordinary cast iron; and the invention con-
sists in subjecting such articles, after having
been annealed and refined by hammering,
to the action of the hereinafter described com-
pound, whereby the cutting edges and other
thin portions of the articles which have been
decarbonized and softened during the anneal-
ing are recarbonized, so that they may be tem-
pered like ordinary steel.

The tools or other articles are cast of ordi-
nary cast iron in any common and well-known
manner, and then partially decarbonized in a
suitable annealing furnace until capable of be-
ing worked under the hammer, when they are
removed from the furnace and refined by ham-
mering to any desired degree. By the process
of annealing, the surface or outer skin of the
articles, and more especially the cutting edges
thereof, have become so much decarbonized
that they cannot be tempered in the ordi-
nary manner. In order to recarbonize these
soft portions of the articles the latter are
heated to a bright red color and immersed in a
compound or preparation consisting of the fol-
lowing ingredients proportioned as follows:
Eleven parts of animal charcoal, nineteen parts
of lamp black, seventeen parts of sal-soda,
seven parts of muriate of soda, five parts of
black oxide of manganese, three parts of pul-
verized limestone, eleven parts of prussiate of
potash. The heated articles are allowed to re-
main in this compound until cold, when their
surface and thin portions will be found to be
so recarbonized as to enable the articles to be
tempered like ordinary steel.

Claim.—The process of converting malleabi-
lized cast iron into steel by heating the iron to
a bright red color, and then immersing it in a
compound or preparation consisting of eleven
parts animal charcoal, nineteen parts lamp
black, seventeen parts sal-soda, seven parts
muriate of soda, five parts black oxide of man-
ganese, three parts pulverized limestone, and
eleven parts prussiate of potash, and allowing
the iron to remain therein until cold.

Bessemer Steel Plants.—The Deutsche
Industrie Zeitung gives the following as the
number of Bessemer plants in various states,
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	Plants.	Converters.
England.....	21	105
Prussia.....	14	61
Bavaria.....	9	4
Saxony.....	1	4
Austria.....	1	2
France.....	12	36
United States.....	8	22
Total.....	67	247

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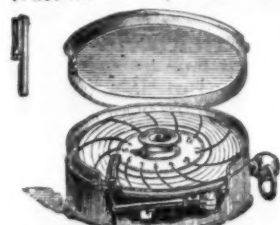
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No. 131,441, 131,442, 131,443, 131,444, 131,445, 131,446, 131,447, 131,448, 131,449, 131,450, 131,451, 131,452, 131,453, 131,454, 131,455, 131,456, 131,457, 131,458, 131,459, 131,460, 131,461, 131,462, 131,463, 131,464, 131,465, 131,466, 131,467, 131,468, 131,469, 131,470, 131,471, 131,472, 131,473, 131,474, 131,475, 131,476, 131,477, 131,478, 131,479, 131,480, 131,481, 131,482, 131,483, 131,484, 131,485, 131,486, 131,487, 131,488, 131,489, 131,490, 131,491, 131,492, 131,493, 131,494, 131,495, 131,496, 131,497, 131,498, 131,499, 131,500, 131,501, 131,502, 131,503, 131,504, 131,505, 131,506, 131,507, 131,508, 131,509, 131,510, 131,511, 131,512, 131,513, 131,514, 131,515, 131,516, 131,517, 131,518, 131,519, 131,520, 131,521, 131,522, 131,523, 131,524, 131,525, 131,526, 131,527, 131,528, 131,529, 131,530, 131,531, 131,532, 131,533, 131,534, 131,535, 131,536, 131,537, 131,538, 131,539, 131,540, 131,541, 131,542, 131,543, 131,544, 131,545, 131,546, 131,547, 131,548, 131,549, 131,550, 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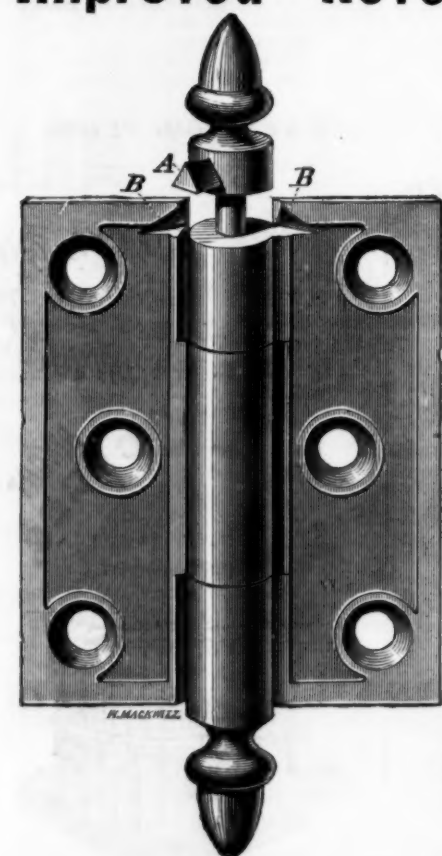
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HORSE AND MULE SHOES.**The Geological Survey of New Jersey for 1875.**

The report of the Geological Survey of the State of New Jersey, conducted by Prof. Geo. H. Cook, has just been received. From it we learn that the year's work of the geologist and his assistants consists of the following undertakings:

1. Survey and final report on the fire and potter's clays of Middlesex county.
2. Collection of specimens of rocks, ores, minerals, soils, &c., for the Centennial Exposition, and the State cabinet.
3. On the construction of a topographical map of the State, and the aid furnished by the United States Coast Survey in preparing for it.
4. Drainage.
5. Water supply for towns and cities.
6. Laboratory work, regular and miscellaneous.

The report on the fire clays of Middlesex county is interesting, but we cannot spare space for it. We make room, however, for Prof. Cook's remarks on the ores and mining interests of the State, which will be read with interest:

The mining industry of the State partakes of the depression so general in all branches of business. And that portion devoted to iron mining is more seriously affected in consequence of the stagnation in the manufacture of iron. During 1874 many of the companies kept their force of labor in the mines nearly, if not quite, equal to that of 1873, hoping for a revival of business and a better demand for ore, and thus to be ready to reap the first results of such improvement, and also to keep their mines in a good working condition. This, in part, explains the comparatively small decrease in the amount of iron ore mined last year as compared with that of 1873. During this year there has been a marked change. The continued lack of demand has discouraged work, and in nearly all the large mines the mining force has been reduced to a minimum consistent with keeping them from suffering injury by an entire standstill. Several of the large companies have stopped altogether. The smaller mines and individual enterprises are doing even less than the companies. We have no figures of ore mined for the year up to date, but from a careful survey of the iron ore district it is very certain that the reduction in the product of 1875, compared with last year, will greatly exceed the loss in 1874. As many of the furnaces are out of blast, the stock at the mines is generally much greater than ever before. In some cases the accumulation is at the furnaces. So that, altogether, there is a large amount of ore ready for them whenever the demand for iron shall call for it. One company is reported as having 100,000 tons of magnetic ore stocked. And there is probably as large an amount now on the bank at a half dozen of our larger mines.

In the midst of this almost universal depression there are some marked exceptions. These are doing quite as much as in any previous years, while there are a few newly opened localities which are being quite actively worked. In a few cases there are special business arguments which are driving them. But in the most of them we find the superior character of the ore—its adaptation to the manufacture of iron for Bessemer steel—claiming a market for it and enabling its owners to keep at work. Such ores are wanted and command remunerative prices, and mines having such can be worked profitably and vigorously even in these times. It would probably be invidious here to enumerate, if it were possible, the mines which are furnishing Bessemer ores, as they are known to the iron men generally. It is, however, eminently proper to state here that we are not yet fully acquainted with even the best known mines so as to say in advance of chemical examination, what ores may or may not be suitable for Bessemer steel. Our knowledge of the geological structure of the iron ore district is yet too incomplete to enable us accurately to locate all the ores free, practically, from phosphorus. Hence the urgent importance of ascertaining at all times, and especially at the present, what are the capabilities and values of the ores raised in all of our mines. The force of this becomes more apparent by a reference to the past. Only a few years ago there was scarcely any ore mined in the State which was supposed to do for making into steel. We had no Bessemer ores on account of the assumed universal presence of too much phosphorus. Chemical analysis followed by experiment and routine practice have upset this wrong conception so much that in 1874 several furnaces made steel pig, running on New Jersey magnetite. Their success has started the examination of known ores, and stimulated prospecting in search of new mines of the same character. And every mine owner should consider this matter and examine his ores. A reference to the reports of previous years will show that there are several localities in the State where such ores occasionally occur in workable beds, and they ought to be tested. It was stated in the report for 1873 that the ores found in the northwestern or Pequest belt were characterized by the presence of manganese, and further, the analysis of several of them showed low percentages of phosphorus.

That this character will be found to be true, generally, there is little doubt. Here, then, is a belt of country where the prospector has a field for his operations, and success in it will lead to work and demand for his product. But this generalization is not confined to this belt. The analyses given in this report exhibit only traces of phosphorus. Further surveys and chemical investigations may bring out a series of ranges of ores containing no phosphorus. In view of the future increasing and wider use of steel over that of iron there is the strongest probability that all ore which can be used in its manufacture will find a more ready sale and great demand than the ordinary ores containing phosphorus, unless some process, efficient and practicable, can be found which will remove this element so prejudicial to the highest value of iron. In the old method of iron making in the Catalan forge, our ores which had a comparatively large amount of phosphorus in them were used and made excellent bar iron. In this mode of manufacture the phosphorus nearly all went out in the clinker, whereas now, in the more intense heat and greater reducing action of our high blast furnaces, it is released from its combination as existing in the ore and enters the iron. It should here be stated that in the magnetic iron ores of New Jersey the phosphorus is combined with lime, forming the mineral apatite, or phosphate of lime, which mineral is only mixed with the oxide of iron of the ore. The grains of apatite are plainly seen, and in the small way can easily be separated or picked out. Any method which can be discovered of separating this mineral from the magnetic, either before smelting, by some roasting process, or by causing it to go out in the clinker, will allow of the use of nearly all of our ores in making steel, and work a great change in iron metallurgy, and add very largely to the industry of our State. No field seems more tempting to the inventor, and we cannot conceive of any more marked or valuable step in the metallurgy of iron than this would be, nor of one more to be desired. The subject deserves the attention of scientific as well as practical men, and further, of all who are interested in the development of the resources of our State. And when we consider how the great difficulty in the practical use of sulphurous ores has been overcome we feel confident that the inventive genius of our iron workers will yet solve this problem.

The ores which formerly were considered almost worthless in consequence of the large amount of sulphur in them are now successfully used, the removal of the sulphur being effected by treatment in roasting furnaces previous to going to the blast furnace. One of the latest forms of such furnace has been designed and erected by Wm. Taylor, formerly of High Bridge, at Chester, Morris county. This is said to do the work effectually and very cheaply, beside putting the ore in a better condition for smelting than in its raw state.

The Late William Richards.

From a sketch in the Youngstown Tribune of the life of the late William Richards, whose death we announced last week, we take the following particulars additional to those given at that time:

He was, in many respects, a remarkable man, and having been one of the pioneers in the iron business in the Mahoning Valley, it seems fitting that a brief sketch of his life should be given to the public.

Mr. Richards was born in Quaker's Yard, Glamorganshire, Wales, in May, 1819, and was, consequently, at his death, nearly 57 years old. He left Wales, in company with his mother and sister, who were dependent upon him for support, in 1840, and first obtained employment at his trade, that of a blacksmith, in Cleveland. After remaining in Cleveland about one year, he went to Middlebury, O., and worked at his calling at that place and at Akron about four years. He was married in 1843 to Miss Mary Ann Hellawell, sister of Allen Hellawell, of this city. The marriage took place at the residence of Wm. Philpot, at Middlebury, O., and simultaneous with the marriage of Mr. Philpot's daughter, Dorothy, to the late David Morris.

He left Akron in 1845 and came to the Mahoning Valley in search of employment, and readily obtained it with Wm. Harris, who was at that time engaged in managing a coal mine in Brier Hill: in fact, his arrival at Brier Hill was quite opportune, as Mr. Harris was having trouble with his machinery, and Mr. Richards speedily set matters right. He remained with Mr. Harris until the coal was all mined out, and from there he went to Niles, O., and entered the employ of James Ward & Co., with whom he remained about three years. We next find him working at his trade at the Eagle Furnace, at that time owned and operated by Wm. Philpot, Jonathan Warner and others. In 1850 Mr. Richards contemplated joining the army of California gold hunters, but, by the advice of Governor Tod, who had just retired from public life as Minister to Brazil, the project was abandoned, and Mr. Richards accepted a contract from Mr. Tod for the construction of a number of coal cars. From the proceeds of this contract he purchased a farm near Girard, which was his home for many years. His first experience in blast furnace practice was for Crawford, Morris & Co., in 1853, at the Eagle Furnace. In 1856 he operated, for James Ward & Co., what was then and is still known as the old Brier Hill Furnace. James Ward & Co.'s lease expired in 1858, and the furnace was then rented to Brown, Bonnell & Co., and for this latter firm Mr. Richards operated the furnace by contract until 1863. In 1863 he formed a copartnership with George C. Reis, Wm. H. Brown and Andrew B. Berger, under the firm name of Reis, Richards & Berger, and purchased the rolling mill and furnace at Newcastle, known as the McCormick property. The works when purchased were in a dilapidated state, but under Mr. Richards' energetic supervision were speedily put in running order. Mr. Richards remained in the firm of Reis, Richards & Berger nearly two years, when he sold out to his copartners, realizing handsomely on his investment.

In 1865, accompanied by his wife and two oldest children, he went to Europe, and spent several months visiting his old friends and relatives. He then returned to his Girard farm and undertook to settle down to a quiet life, but his restless energy forbade this, and early in 1866 he formed a copartnership with the late

David Tod, Wm. Ward and Joseph G. Butler, Jr., under the name of the Girard Iron Company, and the Girard Furnace was built under Mr. Richards' immediate supervision. Mr. Richards remained a partner in the Girard Iron Company until December, 1871. In 1870, induced by the glittering offer of a loan of \$75,000, at a low rate of interest, by the citizens of Warren, he removed to that place, purchased the old Packard & Barnum rolling mill, and erected a blast furnace, and in a short time had invested the aforesaid loan and his entire fortune beside, nearly \$100,000 additional, being the proceeds of the sale of his interest in the Girard Furnace and coal mines, and his Girard farm. For a brief period he prospered at Warren, but the times were out of joint, the panic of '73 and hard luck, generally, struck the iron business of the country, and more particularly the Mahoning Valley, and he was stripped of his fortune, and compelled to suspend operations in December, 1874. Since that time his health has gradually failed, and it seems to be conceded that his days were shortened by his business troubles.

Prof. Kick's Criticism on Prof. Thurston's Researches and Deductions.

We have just had laid upon our table a criticism upon Prof. Thurston's experiments upon the strength of material, and the professor's reply to the same. The criticism is by Frederick Kick, of the Prague Institute of Technology. The latter has been making some experiments upon the compression and tensile strengths of metals, and finds his results are not always similar to those of Prof. Thurston. Immediately taking it for granted that the latter's more sensitive machine must give erroneous results, he attacks Prof. Thurston's well known essays on this subject. We have carefully read his article, and must say that he appears to have paid very little attention to the facts in the case, being more anxious to prove Prof. Thurston's experiments valueless than to ascertain the facts in the case. His knowledge of the papers which he criticises is surprisingly small. He seems never to have seen an autographic testing machine, and certainly has never experimented with one. We note some very curious statements which are at variance with the facts. Of the well known fact that metals having internal strain show a dropping line in the diagrams below the limit of elasticity, he says: "In consequence of the inherent error of the apparatus [this] is in general incorrect." This is simply denying a fact not only well known, but indisputable; the ignorance or folly which causes him to deny it is marvelous. The whole of the trouble, however, seems to be in the fact that Kick's experiments have not been either accurate or valuable, and hence his dissatisfaction with those that are. Had we space to go into the mathematical part of the criticism, the weakness of Kick's position would be still more apparent. We may say, however, that one of the sources of error upon which he lays great stress resolves itself into a fraction of one per cent., and in another case the error "may possibly amount to 0.001." In the latter part of the criticism there is such an evident misunderstanding of the subject as to make one wonder whether the author had paid any attention to what he was reading and writing. Prof. Thurston's reply is particularly happy and just.

In the *Bulletin de la Société d'Encouragement*, M. Baccarat describes the mode by which the far-famed French rose and red shades of glass are produced—one of the most critical and beautiful of the arts of industry. In brief, a certain quantity of auriferous glass is prepared beforehand, and run in thin plates, and fragments of these plates are used by the glass blower to fuse upon his work, and thus give it a superficial coloration. It often happens that one and the same composition of auriferous crystal gives plates of very different shades, some colorless, others tinged more or less deeply with rose or red, and some almost black; these differences being due to two causes, namely, the temperature of the furnace in which the fusion has been effected, and the temperature of the mold into which the melted metal is run. For light colored plates the temperature of the furnace is made low, and the mold very cold; blue plates are sometimes produced under the same circumstances, which, if reheated, take the normal color, as do also the colorless and very pale rose glasses. The curious facts thus developed, in regard to the process in question and its results, render it probable that the coloring matter is neither a salt nor an oxide, but a simple body. Crystal colored with gold is therefore merely a vitreous matter, holding in suspension metallic gold in a state of very fine subdivision. It is stated that on attentively examining the red plates, it is easy to recognize in the mass a multitude of most brilliant specks of metallic gold, forming a sort of adventurine.

There would appear to be absolutely no limits to the mineral wealth of Nevada. Now we hear of deposits of coal in one section, then cinnabar formations, while borax is said to be found all over the State. Copper deposits, according to the *Virginia Enterprise*, are found about some 40 miles south and east of Virginia City. The ledge is said to be from five to twenty-five feet in width, has a north and south trend, and is well defined, being a contact vein with a western wall of limestone, while the eastern is quartzite. The ore exists in the form of carbonates and red oxides, and is found to be very rich. A few sulphurets have also been found, but none of these have been reduced. Says the *Enterprise*: "Since these present owners have been in possession of the claim they have taken out and disposed of \$50,000 worth of ore, and have as yet scarcely commenced the development of the mine. The cost of extracting and getting the ore to market is now about one cent per pound."

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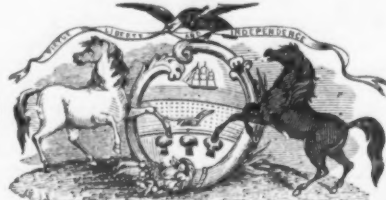
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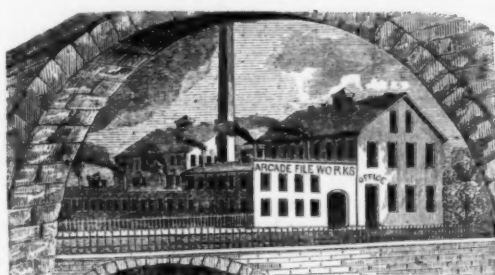
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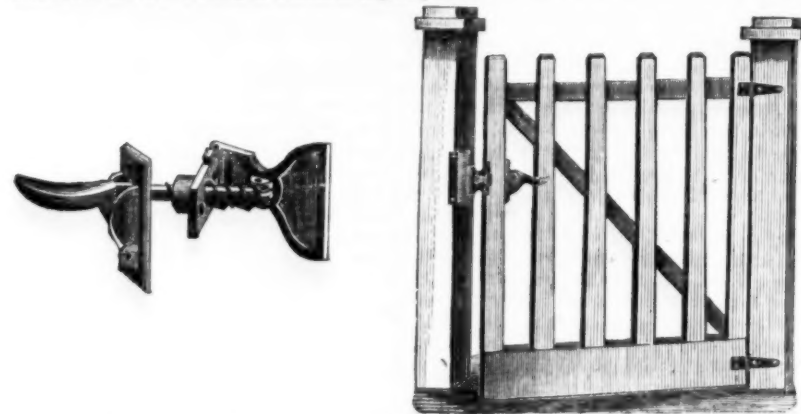
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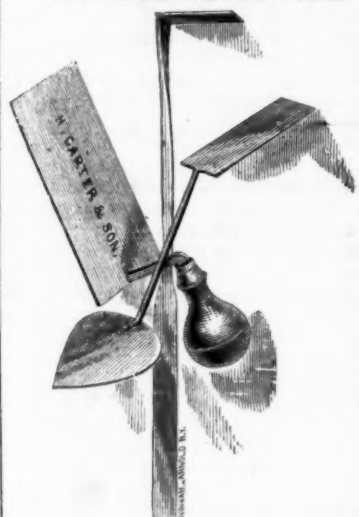
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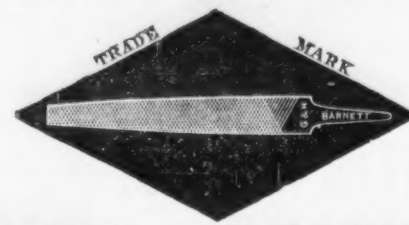
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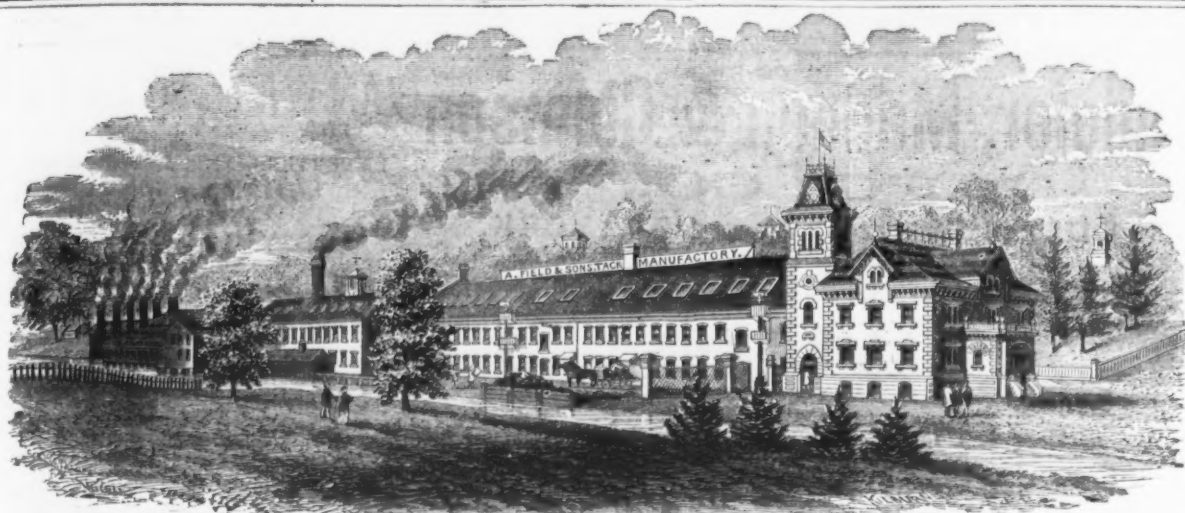
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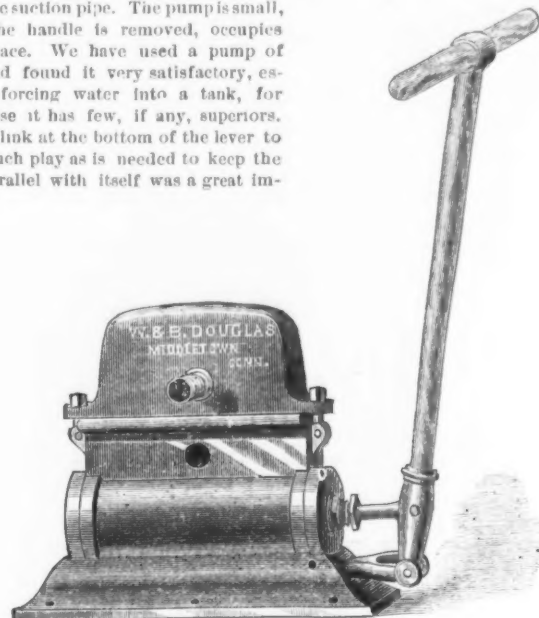
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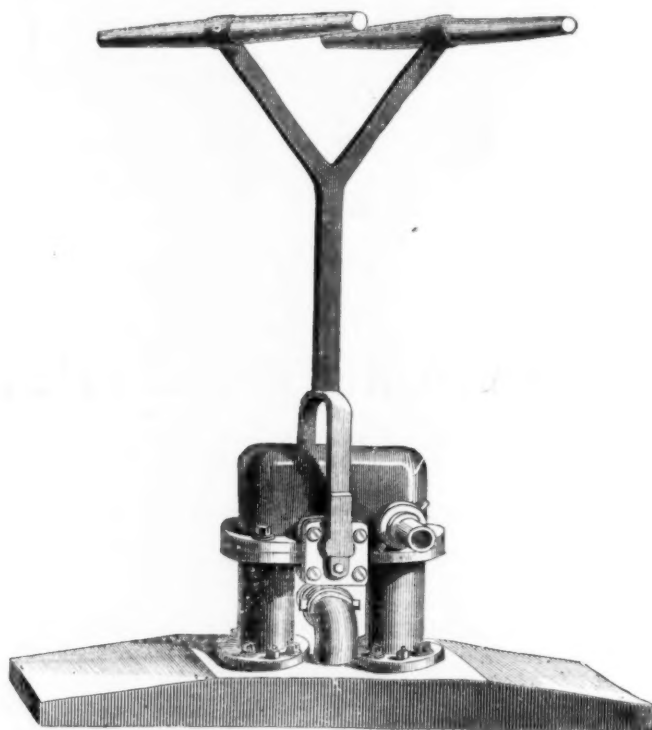


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These pumps are made with or without brass lined cylinders. The sizes range from 3 up to 5 inches in diameter. These pumps are much used for forcing water into tanks of city houses. The double-acting brass ship pump has the same method of applying power as the pump just named. It is mounted upon a wooden foot, and is intended for use when a great quantity of water is needed. It can be worked by several men, and in the larger sizes a number of men are needed to bring on the full power of the pump. It is especially valu-

able for factory, ship and railroad purposes. In the smaller pump, the one first mentioned, a large air chamber is added when it is intended to use the pump for fire purposes or for throwing water. Messrs. W. & B. Douglass, of Middletown, Conn., are the manufacturers.

Commencing with the javelin or dart fitted with the appliance called the *ancum*, or loop attached to the center of gravity, whereby the range is greatly increased, it was shown that a distance of 60 yards was attained against the wind, 72 yards having been attained under more favorable circumstances. The *pilum* or Roman javelin came next; this consists of a pointed iron head let into a handle of wood like a harpoon, and about 6 1/2 feet long, and was the favorite weapon of the Roman soldier at about 20 yards distance prior to an on-slaught with the sword. This was followed by small iron-pointed darts, discharged with a sling to a great height, and falling point downward some 70 or 80 yards off. As a variety of those hand weapons the use of the *asegai*, with the aid of the wooden *winnowa*, was illustrated, ranging 70 or 80 yards, with surprising accuracy. Subsequently the machines of the catapult class were set in action; firstly, the *onager*, consisting of a strong wooden lever affixed between two tightly twisted knots of cord, attached to a stout, heavy, wooden frame; the outer end of the lever is drawn back by means of a winch, and then made fast by a cord passing through a



hook; a sling fastened to the free extremity of the lever contains the heavy missile, when, on the cord being slipped by a trigger, the tension of the cords forces the lever forward with great force, projecting the heavy mass to a considerable distance, such as 140 to 180 yards. The *ballista* is constructed on somewhat similar principles, the strain or torsion on twisted cords drives an arrow, dart, or other projectile, placed in a groove, in a straight line, and with a very flat trajectory, direct to the mark."

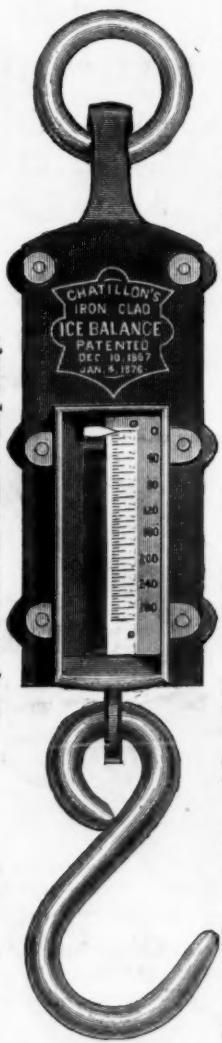
Ancient Engines of Warfare.

The members of the Geographical Congress, assembled in Paris recently, paid a visit to the Musee of St. Germaine, and the correspondent of the *Journal of the Society of Arts* says: "The interest of this city centered mainly in the exhibition of the modern reproductions of ancient offensive and defensive weapons of warfare, and in the practical and experimental demonstrations of their use and power by actual example. The visitors were received at the Gallo-Roman Museum by the director and sub-director, MM. Bertrand and De Mortillet, as also by M. Abel Maitre, engineer in chief of the workshops attached to the institution, the skillful constructor of these reproductions of ancient military appliances. These latter were deemed necessary by the late emperor, Napoleon III, for the work of preparing his 'Life of Caesar'—rendered for the moment a familiar subject here by the trial of the action brought by the executors of the publishers, MM. Plon et Cie, against his majesty's executors, to recover £6000 damages for non-completion of the work and non-fulfillment of contract, in which the Paris Tribunal has just nonsuited the plaintiffs—and in consequence the present collection was made of the dimensions and materially as described by Latin authors. A range had been prepared and marked out at 10 meter intervals (11 yards, or half a chain); and M. Maitre exemplified by the exercises the use and power of each weapon.

M. Mouchot has devoted a long time to the consideration of the problem of the application of solar heat to motors, and according to our contemporary, the *Annales du Genie Civil*, he has succeeded in solving it. The apparatus which he has invented consists of three principal parts, a mirror, with what is called a linear fire place, a blackened boiler, the arc of which coincides with this fire place, and a glass covering which permits the rays of the sun to reach the boiler, but prevented their return after they have been converted by means of the latter with dark rays. The opening of the mirror, which has the form of a truncated cone, is turned toward the sun. The generator of this trunk forms an angle of 45° with the axis. The foundation of the mirror is a disc of cast iron, which is intended as a guard against the action of the wind. The boiler, which is of the same height as the mirror, rises to the center of the disc; it is composed of copper, blackened on the outer side; it has a double covering with the feed water between. The results obtained in ordinary weather are given as follows: Twenty litres of water were introduced at a temperature of 20° Centigrade, and in 40 minutes steam was produced with a pressure of two atmospheres, and a few minutes afterward of five atmospheres, and was sufficient to drive several motors.

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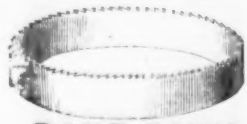
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CIRCULARS, CROSS-CUTS, MILL, MULAY, GANG, HAND, & BUTCHER.

Molding and Planing Knives, Plastering Trowels, Mitering Rods, &c.

FACTORIES:

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OFFICE & WAREHOUSE, 59 Beekman Street, New York.

THE SILVER STEEL DIAMOND CROSS-CUT SAW.

\$1.50 Per Foot.

Patent Secured

THIS new Saw, which is destined to take the place of all Cross-cut Saws in point of **SPEED AND EASE**, is manufactured by E. C. ATKINS & CO., Indianapolis, Ind., who are the **SOLE MANUFACTURERS FOR THE UNITED STATES**. So confident are we that this is the best Cross-cut Saw in the market that we **CHALLENGE THE WORLD**. Orders promptly filled. **E. C. ATKINS & CO.** Saw Manufacturers and Repairers, Indianapolis, Ind.



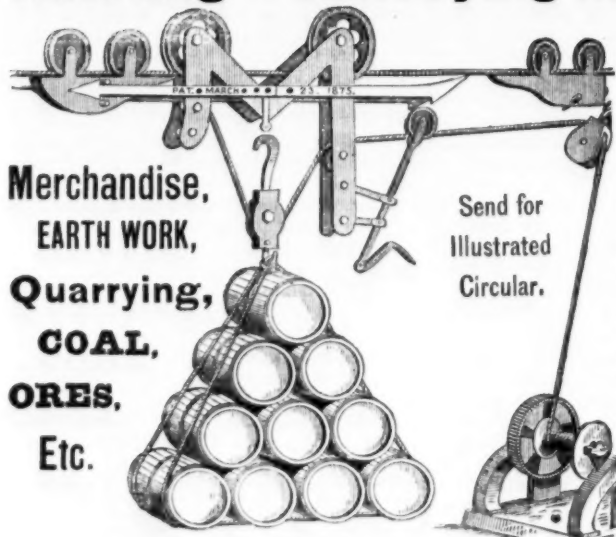
ICE CREAM FREEZERS.

These Freezers have been in use since 1860 with the most flattering results, and they have well earned the reputation of being the **BEST ICE CREAM FREEZER** ever introduced, and have been awarded the highest premiums. No expense is spared to render them perfect, improvements being constantly introduced in their manufacture; they are simple in their construction, containing no complicated machinery, are not liable to get out of order, and perfect in operation. They are made in the most durable and substantial manner; none but the best materials are used in their construction, and the mechanical arrangements are such that they will freeze Cream, Fruits or Water Ices in the shortest possible time.

DOUBLE ACTION FREEZER.			COG WHEEL FREEZER.		
SIZES AND PRICES.			SIZES AND PRICES.		
10 quarts.....	\$15-00	2 quarts.....	\$3-50	8 quarts.....	\$9-00
15 ".....	\$20-00	3 ".....	4-50	10 ".....	12-00
25 ".....	25-00	4 ".....	5-50	15 ".....	15-00
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For sale in New York at minimum rates by Wholesale Dealers in House Furnishing Goods generally.
CHARLES W. PACKER, Manufacturer, Philadelphia.

Hoisting and Conveying Machine



Merchandise,
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Quarrying,
COAL,
ORES,
Etc.

Send for
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These Machines are Automatic, combining simplicity, general utility, and great facility in their working. Weighing apparatus can be attached to the machine and will weigh without cost.

Engineers' Office,
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We use five machines most of the time, storing 300 tons in 10 hours with each machine and one man, at a cost of three cents per ton. When using three machines the cost is 1 1/2 cents per gross ton.

BLACK DIAMOND STEEL WORKS, Pittsburgh, Pa.
The Hoisting and Conveying Machine suits us; we cannot say too much in its favor.

LEHIGH & WILKES BARRE COAL CO.,
20th St., E. R., New York.
We use your machine, one man only being required to operate it. It is a decided improvement over any method we have ever seen for hoisting and conveying material of any kind.

For further information, Address,

U. S. HOISTING AND CONVEYING CO.,
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MFG. CO.,

MIDDLETOWN, - - - - NEW YORK.

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WARRANTED CAST STEEL

SAWS

Of every description, including

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Manufacturers of

Movable Toothed Circular Saws,
PERFORATED CROSS-CUT SAWS
And **SOLID SAWS** of all kinds. Trenton, N. J.

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Sole Manufacturers of the Celebrated

"Diamond" PLANE IRONS,

EXTRA PLATED TABLE CUTLERY. PATENT FORGED OX SHOES. The only Shoe made with concavity to fit hoof. BENCH AND MOULDING PLANES of every description, &c., &c. Drop Forgings to order. Address for Catalogue with stamp.



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Electro Plated Ware, German Silver and Britannia Spoons.



THE "PALACE."

Factories, Wallingford, Conn.

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PYROMETERS

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E. BROWN'S STANDARD PORTABLE.

E. Brown's Improved

Gauntlet



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ALSO FOR SALE

PYROMETERS

For Baker's Ovens, Boiler Flues, Galvanizing Baths, Oil Stills, Vulcanizers, Superheated Steam. Over 300 "Gauntlet" and 100 Portable Pyrometers are now in use at Blast Furnaces.

E. Brown's Portable Blast Gauge for the plug hole, Steam Gauges, Blast Gauges, Mercury Gauges, Recording Steam Gauges, Engine Counters, Indicators for ascertaining the Horse Power.

ALSO,

REVOLUTION INDICATORS.

The Revolution Indicator is driven like a governor, either from a horizontal or vertical shaft; it constantly indicates, without the use of a watch, the number of turns per minute made by a Steam Engine.

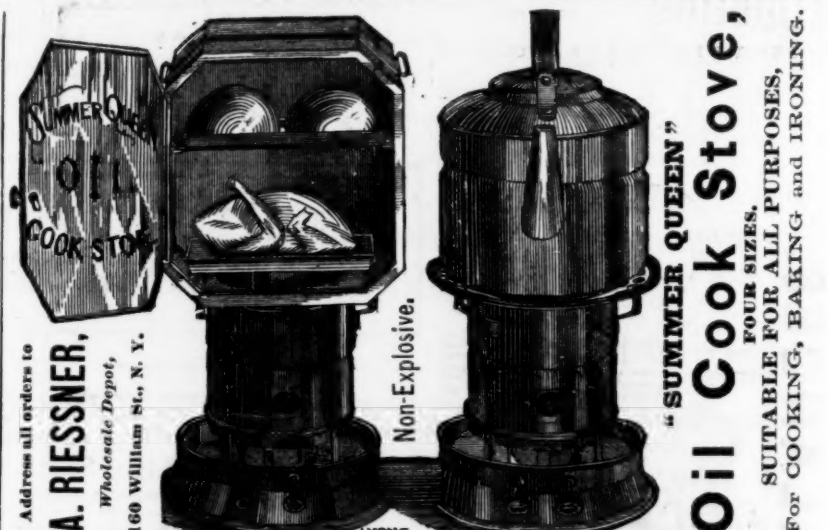
There are many engines which have to run at varying speeds for different operations, also engines controlled entirely by hand. For such, the Revolution Indicator will be found particularly useful.

Circulars on application.



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Steam, Blast, Vacuum and Hydraulic Gauges, Engine Counters, Pyrometers, Bull Patent Governor, Steam Reducing Valves, etc. Sole Depot
W. HEUERMAN, 4 Cedar St., N. Y.



Address all orders to
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1776. CENTENNIAL CURRY COMB. 1876.

They can be grasped by the handle directly over the top, or by the handle back of the comb, as commonly used.

THEY ARE THE

Strongest and Most Durable Comb Made,
No Malleable Iron being used in their construction.

EVERY HAND WARRANTED KEYED ON.

They have no Wire

Running through the bars to catch the

HAIR AND DIRT.

Catalogues furnished on application.

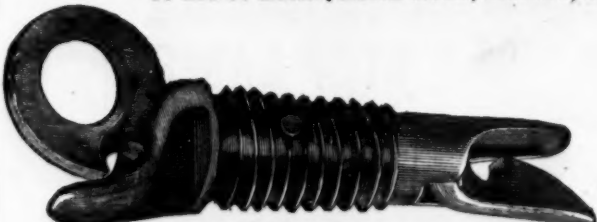
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Wiebusch & Hilger Hardware Co.,

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Improved Screw Fast.

Manufacturers of every variety of

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We offer from Stock and Contracts at generally reduced prices:

35,000 doz. Window Pullies. 30,000 lbs. Machine Finishing Nails.
20,000 lbs. Boardman's Barbed Staples. 500 doz. Sash Cord.
Full stock of Foreign and Domestic Glue, Sand Paper, Emery Wheels, Emery Grinders, Washington Mills Emery, American Window Glass, etc., etc.

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Hardware Commission Merchants,
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At each of these places a complete assortment of samples of Hardware and Fancy Goods will be found, including all new descriptions. Sole Agents for

John Rimmer & Son's Celebrated

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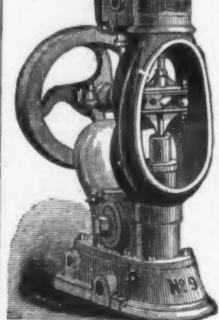
W. Clark's Genuine Horse Clippers.

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OSCAR IRVING VAN WART & Co.,

FORWARDING AGENTS,

2 South John Street, LIVERPOOL.



WASHINGTON, D. C.,
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Treas. Valley Machine
Co., East Hampton,
Mass.
Dear Sir: The
"Wright Bucket Plunger
Steam Pump" you
built for the Government
works like a
top. Am sure it has
never had its equal in
any of the departments,
and I have no hesitancy
in recommending this
Pump to any one in
want of a first-class,
noiseless Steam Pump.
Very respectfully,
J. THOS. MILLER,
Chief Engineer U. S.
House of Representatives.

Send to us for Catalogue.

Valley Machine Co.

Cutlery.

THE LAMSON & GOODNOW MFG. CO. N.Y.

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AMERICAN TABLE CUTLERY & C.

FRIEDMANN & LAUTERJUNG,
MANUFACTURERS OF

Pen and Pocket Cutlery, Solid Steel Scissors, Shears, Razors, Russia Leather Straps, Hones, &c.

Sole Proprietors of the renowned full concaved patent

"ELECTRIC RAZORS,"

And the celebrated **"ELECTRIC SHEARS,"** Nickel Plated Hones.

Agents for the BENGALL RAZORS.

AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.

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TABLE KNIVES AND FORKS OF ALL KINDS,
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THE PATENT HARD RUBBER HANDLE TABLE KNIFE

Also the exclusive makers of the "Patent Ivory" or Celluloid Knife, which is the most durable White Handle Knife known. These Handles never get loose. Always call for the "Trade Mark"

"MERIDEN CUTLERY COMPANY" on the blade.

Warranted and sold by all dealers in Cutlery, and by the MERIDEN CUTLERY CO., 49 Chambers St., N. Y.

THE MILLER BROTHERS CUTLERY CO.,
Manufacturers of

PATENT FINE PEN & POCKET CUTLERY

WEST MERIDEN, CONN.

The only Knives made that are put together in such a manner that there is no strain on the covering or frail part of the knife. We warrant our knives equal in cutting qualities and workmanship to any made, and are acknowledged by English makers as the **Best American Knife.** We also make

NICKEL & SILVER PLATED POCKET KNIVES

which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other knife. Orders filled from the factory, and in New York by Messrs. J. Clark Wilson & Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by Messrs. G. B. Walbridge & Co., No. 99 Chambers Street.

Naugatuck Cutlery Co.,
Manufacturers of FINE

PEN and POCKET CUTLERY.

FULLER BROTHERS, Sole Agents, 89 Chambers and 71 Reade Sts., N. Y.

JOSEPH RYALS, Collinsville, Conn.,
Manufacturer of Patent

SHEARS & SCISSORS. Orelad Handles Crocus Finish.

Made by a new process **RECENTLY PATENTED** which enables me to produce goods that in quality, finish, and general excellence surpass any. All warranted Solid Cast Steel Blades.

ROGERS & BROTHER,
MANUFACTURERS OF

Fine Electro Silver Plate,
Will Remove about May 1st to

690 BROADWAY.

ESTABLISHED 1852.

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MANUFACTURERS OF SUPERIOR

Table & Pocket Cutlery,
WARRANTED TO BE MADE OF THE BEST MATERIAL.

WALKILL RIVER WORKS,
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Manufacturers of Albion & Britannia

TEA and TABLE SPOONS,
Caster Frames, Ladles, &c.

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BORAX.

We beg to offer to the trade our own well known brand of strictly pure crystallized Borax, in barrels and cases, at greatly reduced prices. Apply for terms at

CHAS. PFIZER & CO.,
Manufacturing Chemists, New York.

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EMANUEL MARX,
IMPORTER OF

Table & Pocket Cutlery,
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AMERICAN PEN AND POCKET KNIVES,
MANUFACTURED BY **PEPPERELL,**
Aaron Burkinshaw, MASSACHUSETTS

My Blades are forged from the best Cast Steel, and warranted. To me was awarded the GOLD MEDAL of the Connecticut State Agricultural Society, also a gold and Diploma from the Mass. Mechanics' Ass'n Sept. 1867.

FURNESS, BANNISTER & CO.
Manufacturers of

Fine Table CUTLERY.
Cor. Nassau & Sheffield Sts., NEWARK, N. J.

BETTS & BURGER,
95 Chambers Street, N. Y.
Commission Merchants,
And Dealers in
Hardware and Cutlery Bargains.
Solicit Agencies and Consignments.

Cutlery.

KING, BRIGGS & CO.
ENGLISH HARDWARE.
WOSTENHOLM'S (IXL)
POCKET KNIVES,
KNIVES & FORKS,
RAZORS,
SCISSORS, FILES, CHAINS,
ANVILS, VISES,
GUNS.

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JOSEPH S. FISHER,
No. 411 Commerce St., PHILADELPHIA
AGENT FOR

George Wostenholm & Son,
"Limited."
Washington Works, SHEFFIELD,
Celebrated I-XL Cutlery, Razors, &c.

AGENT FOR

WALTER SPENCER & CO.,
Steel and File Manufacturers.
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Granted 1777.

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Importer on Commission
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CORPORATE MARK,

Joseph Rodgers & Sons' (LIMITED)
CELEBRATED CUTLERY,
No. 82 Chambers Street, New York.
F. & W. CLATWORTHY, Agents.

The demand for Joseph Rodgers & Sons' productions having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam works.

To distinguish Articles of Joseph Rodgers & Sons' Manufacture, please to see that they bear their Corporate Mark.

ASLINE WARD,
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FREDERICK WARD & CO., Sheffield,
Cutlery and Table Knives.

CORPORATE MARK.

B4*ANY

Young's Patent Folding Scissors.

PAT. MAY 28 72.

These Scissors are made of the very best steel, nickel plated, and so constructed that they can be readily folded and carried in the pocket without injury to the garments. A sample pair will be sent by mail, so the trade only, upon receipt of the retail price, namely: For small size, either blunt or pointed, \$1.00; for large size, pointed or half pointed, \$1.50. New York, Feb. 1st, 1876.

MARX BROS., Proprietors, 430 Broadway.

ROMER & CO.,
Established 1871. Manufacturers of Patent Scandinavian or Jail Locks, Brass Pad Locks for Railroads and Switches. Also, Patent Stationary R. R. Car Door Locks, Patent Piano and Sewing Machine Locks. 141 to 143 Railroad Avenue, NEW YORK, N. Y. Illustrated Catalogue sent on application.

PHILADELPHIA CORRESPONDENCE.

Office of *The Iron Age*, 220 South Fourth st., PHILADELPHIA, March 14, 1876.

There is no change to note in general business. In every department of trade the depression is almost as great as at any time during the winter, and prospects of an early improvement are not very bright. Money is abundant, and there is very little trade paper offering. Call loans are made at 4 to 5 per cent., and trade paper at from 5 to 7 per cent.

In the coal trade there is no important change. The Philadelphia and Reading Coal and Iron Company started the Plank Ridge and Merriam collieries yesterday, giving employment to a large number of men and boys, and preparations are in progress for a general resumption in the Schuylkill county mines next week. This intelligence will cause general rejoicing, and it is to be hoped that it is the precursor of an era of steady prosperity. After the long strike of last year, and the adverse circumstances which deprived an immense number of persons of their usual incomes for many months, these late suspensions have been particularly inconvenient and depressing, and it is fortunate that the present suspension is likely to be of comparatively short duration.

The bituminous coal trades exhibit more signs of vitality than the anthracite. Some large contracts are in progress of negotiation, based upon a considerable reduction from the prices of last year. We learn that the contract for 70,000 tons Cumberland coal for the New Haven Railroad was made at a shade less than \$3.85, f. o. b., at Baltimore. The price last year was \$4.35. It is stated that, owing to the complicated regulations that are authorized by the "Board of Control" of the anthracite coal trade, with regard to contracts, many of the largest manufacturers and consumers of coal at the East refuse to entertain propositions to contract, and are turning their attention to Cumberland and other bituminous coals, the agents of some of the large bituminous coal companies offering contracts at greatly reduced prices.

In the iron trade stagnation still prevails, and there is no immediate prospect of improvement; prices are weak with a downward tendency, and it is doubtful if a further reduction in prices would lead to any increase of business. In every department the complaint is, "There is no money to be made." Business can be had, but not on a remunerative basis, and a large majority of the establishments which are at work state that they are working without profit, and prefer doing so to closing up entirely. Strong anticipations were felt that, as spring approached, trade would revive, but, so far as the iron interests are concerned, the signs of improvement are as distant as ever.

The Centennial buildings are rapidly approaching completion, and in Machinery Hall hundreds of packages from foreign countries have already arrived.

The rules and information for exhibitors have been issued to this effect: Objects for exhibition will be admitted until April 10, and heavy and bulky machinery must be set up by the 20th of April, and all objects by the 1st of May. All exhibits in the United States section must be entered at the office of the chief of the bureau. The main lines of pipe for steam, water, gas and sewerage will be laid by the commission, but exhibitors must supply all connecting pipes.

No particular form or design is prescribed for show cases, etc., but they must not exceed the following heights without special permission: Show cases and partitions, 15 feet above the floor; counters, 2 feet 10 inches above the floor on the side next the passage-way; platforms, 1 foot above the floor. Machinery must be enclosed in railings. In order to insure the advantageous and satisfactory location of products exhibited, applicants for space desiring to erect show cases, counters or partitions must furnish the bureau with a scale of drawing. The Chief of the Bureau of Machinery has charge of the allotment of space to exhibitors in the United States section.

The grand motor of the mechanical part of the Exhibition is slowly rising to view in the center of Machinery Hall. It is the Corliss engine of 1600 horse-power, which is capable of doing the work of 2500 horses at need.

This titanic engine is coming on in sections by rail from Providence, R. I. It weighs altogether some 700 tons—1,400,000 pounds. Sixty-five cars are required to transport it, and some of its sections are so heavy that the cars on which they are placed have to be of great extra strength. For many weeks pick-axe men and masons were employed upon its deep cemented foundations. The strong frame of timbers by which its several parts are hoisting with pulleys into place now swarms with workmen nearly to the ceiling.

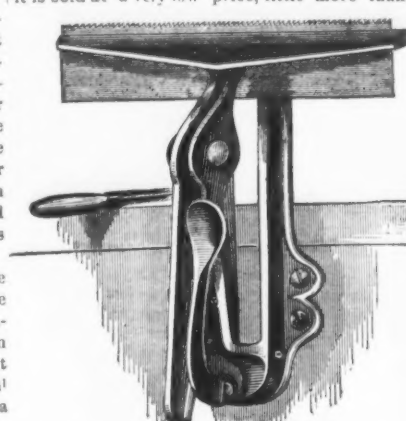
The engine will furnish power to all the machinery in the building. Miles of shafting will lead away from it down the long aisles from end to end. There will be eight main lines—four on each side of the central transept where the engine stands—extending lengthwise. Seven will have a speed of 120 revolutions, and one will have a speed of 240 revolutions a minute. Counter shafts will be introduced into the aisles at any point.

The New Orleans and Pacific Railroad.—The Chattanooga Commercial says: Col. James, the contractor of the New Orleans and Pacific Railroad, was in town recently and made a contract with the Wagon Car Works for his supply of construction cars. Mr. S. B. Lowe, through whom the contract was made, informs us that it is the intention of the company to complete the road as fast as prompt cash payments can do it. Within the next forty days there will be about 1500 convicts at work on the line. The road is to be laid with fifty-four pound steel rail, and its entire equipment

will be first-class throughout. The completion of this line will give New Orleans direct communication with the Texas Pacific at Marshall, and will open up that entire Red River country upon which an embargo has generally been laid for many months each year.

Stearns' No. 0 Saw Vise.

The accompanying cut shows Stearns' No. 0 saw vise, manufactured by Messrs. Geo. N. Stearns & Co., Syracuse, N. Y. This saw vise has been recently added to their assortment of specialties, not as a substitute for their well known saw vise No. 1, but to compete with other cheap saw vises on the market. Although it is sold at a very low price, little more than



the cost of the casting, still it possesses many of the advantages claimed for their No. 1 saw vise, viz., combined power of lever and cam.

The Panama Transit Steamship Company's Steamer, South Carolina.

The steamship South Carolina, of the new Panama Transit Steamship Company, just organized in opposition to the Pacific Mail Steamship Company, sailed this week from Pier 13, North River, for Panama, via the Straits of Magellan. The South Carolina, which formerly plied between New York and Charleston, has been rebuilt and enlarged, and supplied with new engines and boilers. Her carrying capacity is estimated at 1500 tons of cargo, 100 cabin passengers and 200 steerage passengers. She is under the command of Capt. Morton, a master of considerable experience, and well known on the Havana line. The line for the present will run five vessels like the South Carolina. The company are about to build five new ships of a carrying capacity of 4000 tons each, to be completed within twelve months.

The South Carolina runs no further than Panama; the steamer to connect with her, and thus to open the route by way of the isthmus, will sail from New York about April 7, and semi-monthly thereafter until the new fleet is completed. Then it is intended to make weekly trips.

It is understood that arrangements have been perfected between the Panama Transit Steamship Company and all the companies connecting with the Panama Railroad at Aspinwall for transferring to it the business that they bring to the isthmus, as well as for the local business of the isthmus. This will be a serious loss to the Pacific Mail.

The certificate of incorporation of the company was filed in the county clerk's office on the 31st ult. The ports named in the certificate as those with which the company intend to connect are Havana and Matanzas, in Cuba; Sitka, in Alaska; Victoria, in British Columbia; Portland, in Oregon; Santa Barbara, San Luis Obispo, San Huanchaco, Cosmo, Safe Huacho, Callao, Cerro Azul, Pisco, Chala, Islay, Ilo Africa, Cobjia, Pajosa, Chantrel, Caldera, Copiapo, Huasco, Coquimbo and Valparaiso, in South America; Honolulu, in the Sandwich Islands; Melbourne and Sydney, in Australia; Yokohama, Hiogo and Nagasaki, in Japan; Hong Kong and Shanghai, in China; Liverpool, London and Southampton, in England; St. Nazaire and Havre, in France; and Hamburg, in Germany.

Thomas Clyde, of Philadelphia, is president of the company; Frederick Butterfield, a wealthy dry goods merchant of New York, treasurer; and Wm. P. Clyde, general manager. The entire line, with all its connections, is to be under charge of Wm. P. Clyde & Co., of New York, who are well known as owners and managers of a number of lines in the coastwise and West India trade.

The incorporators, in addition to those above named, are Geo. W. Clyde, Benjamin F. Clyde, Andrew Boardman, Samuel Boardman, Edward C. Boardman, Edward A. Price, Frederick Taylor, Amos Rogers and Frederick A. Sawyer. Andrew Boardman, it is said, represents, in addition to his own interest, a large amount of English capital available for the enterprise. The first investment of capital, \$1,350,000, covers the first five ships only. It is to be increased either by bonds or by additional stock, to \$4,000,000 after the completion of the additional fleet.

Speaking of the coming struggle between the Pacific Mail and the Panama Transit Steamship Company, one old steamship owner said, "Some body will get hurt. The Pacific Mail has got the ships and the trade, and will not give this thing up without a fight; and as it is controlled by the same interests as the Union Pacific, they will make things lively and rates low."

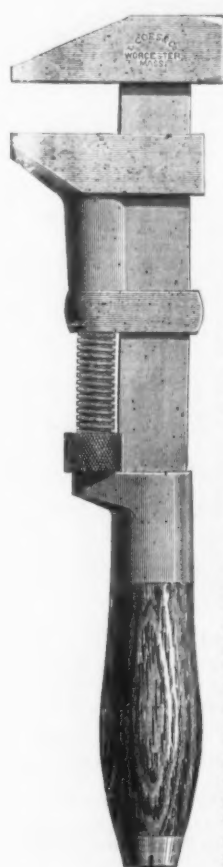
On the other hand, the Panama Railroad is the key of the position, and the new company is in perfect harmony with that company—an advantage which made the Pacific Mail the successful institution that it once was, when its stock went up to \$30.

The new line is said to be organized upon purely business principles as a close corporation, and none of its stock is to be offered for sale on the street.

L. COES' SCREW WRENCHES.

Genuine Improved Patent

Manufactured by

L. COES & CO.,
Worcester, Mass.

We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called "reinforced or jag bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.
HORACE DURRIE & CO., Sole Agents.

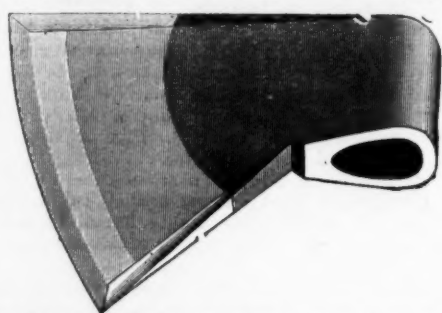
M. H. Jones.

M. H. JONES & CO.
COHOES, Albany Co., N. Y.

A. G. Peck.

Manufacturers of AXES AND EDGE TOOLS.

All Goods Stamped and Labeled
M. H. JONES & CO.
unless otherwise ordered.



Sole right to the use of the
TEN EVCK AXE MFG. CO.'S
Trade Mark.

HORACE DURRIE & CO., Agents, 97 Chambers and 81 Reade Streets, N. Y.

Curry Comb Mfg. Co

Northeast corner High & Friend Sts.,
COLUMBUS, O.

HORACE DURRIE & CO.,
97 Chambers Street,
New York Agents.

Our Combs are made with extra heavy Trowel Shanks, every Comb WARRANTED. They are not full jeweled, do not infringe upon the rights of any of those manufacturers of new fangled ideas, more beautiful in theory than in practice, but they are a common sense Curry Comb that every hostler in the country can use successfully, without undergoing a course of instruction as to the grasping device, &c., &c. These Combs are made both open and close back.

TURNED MACHINE SCREWS.

One-sixteenth to five-eighths diameter.
Heads and points to sample.
IRON, STEEL and BRASS.
Lyon & Fellows Mfg. Co.,
Cor. 1st and North 3d Streets, Williamsburgh, N. Y.

THE ORIGINAL TOMLINSON SPRING & AXLE COMPANY,

ESTABLISHED 1852.
Manufacturers of FIRST CLASS SPRINGS AND AXLES. Also, THE GROOT'S PATENT CROSS SPRING.

RUSSELL TOMLINSON, Pres.
S. H. TOMLINSON, Sec'y and Treas.
C. S. LUTTON, Supt.

BRIDGEPORT, CONN.

All orders promptly executed.
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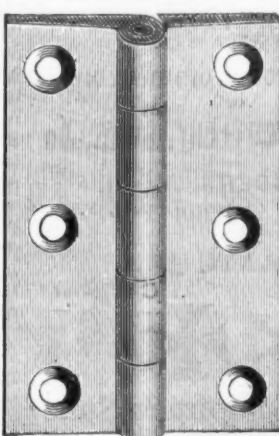
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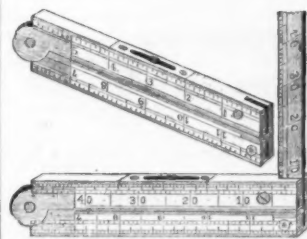
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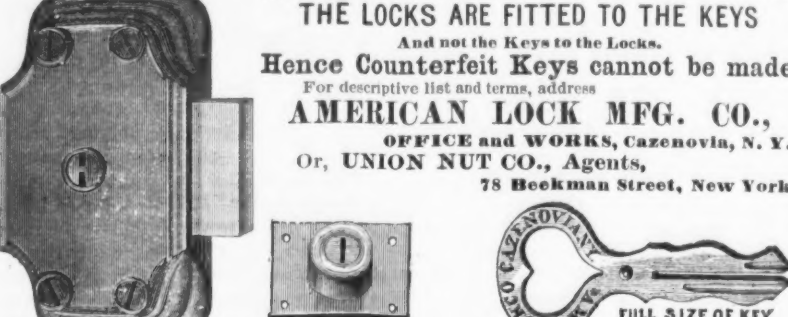
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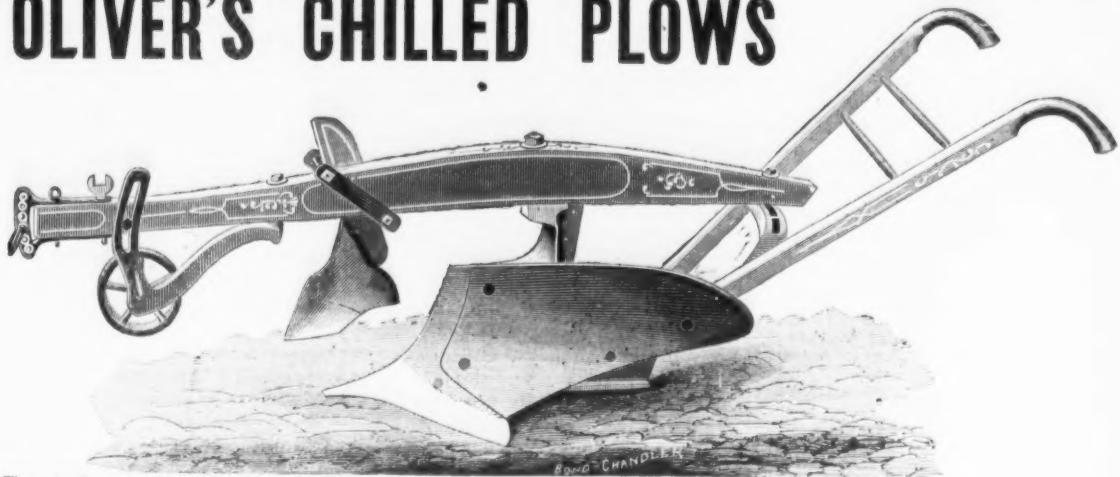


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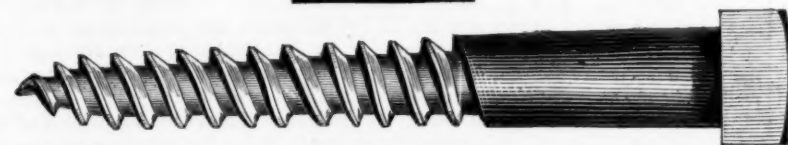
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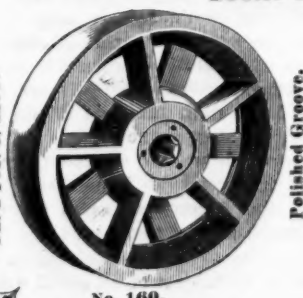
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The Intrinsic Value of Gold.

"Gold has less intrinsic value than silver, but, being less abundant, has been made the standard of value by civilized nations. Therefore, its duty is to make up the balance of trade between nations, and to pay the indebtedness of debtor to creditor nations."

The above is from a dozen or more didactic utterances by Gen. J. Watson Webb, which have been going the rounds of the papers during the past few months under the title of "Truisms not to be Forgotten." The idea has been accepted by a great many writers on finance and economic science, and is a presumption upon which most of the arguments in favor of a paper currency are based. But frequent repetition has not made it true, and how it could have so been accepted as true by men who claim to have a capacity for intelligent thought, is more than we can understand. The intrinsic value of gold is, and always was, the basis of its value as a medium of exchange; and this fact accounts for the

reason why, in all ages and countries since it came into general use, it has been the recognized standard of value. Other metals possess intrinsic value, but few in the same degree as gold, while from their lack of beauty in color or texture, or the readiness with which they are oxidized by atmospheric and other influences, they can never take the place of gold.

As a metal for use in the arts, gold possesses a utility greater than that of any other metal, and its employment is only restricted by its value and scarcity. Suppose it was as abundant as copper; it would not then possess the same value as now, of course, but its intrinsic value would remain vastly greater than that of either copper or tin. In its physical properties it is unlike any other metal. While it can be made, by alloying with other metals, extremely hard, it is naturally as soft as lead, and so ductile that it can be beaten into sheets 1-280,000th of an inch in thickness—so thin, indeed, that an unbroken sheet will transmit light, or a grain may be drawn out as wire to a length of 500 feet. Its tenacity when pure is not so great as iron, platinum, copper or silver, but a gold wire 1-36th of an inch in diameter will sustain a weight of 500 lbs., and, by alloying, its strength may be greatly increased. It remains unchanged by exposure to the air under all conditions; the simple acids—with the single exception of selenic acid—do not affect it; it undergoes no change when exposed to the action of the alkalis, and is only dissolved by some mixture which liberates chlorine, such as *aqua regia*, which converts the metal into a chloride. It is one of the most perfect conductors of heat and electricity; it alloys with silver, copper, iron, and other metals, and its color may be varied from the rich yellow of pure metallic gold, through a range of red, blue, green and light yellow tints. It must be obvious to any one acquainted with the industrial uses of metals, that the practical utility of one possessing all these qualities would exceed that of any other metal known—not excepting platinum, which most nearly resembles it. If any manufacturer of metal goods were asked to what extent it would be possible to substitute gold for the base metals, we should be surprised to learn how wide a range of utility it would possess. Of the articles made wholly or in part of metal in our houses—either for use or ornament—there are very few which could not be best made of gold. For kitchen utensils and culinary vessels no metal could compare with it; for table furniture it would be vastly better than silver, requiring no polishing to remove stains and discolorations; for stoves and stove pipes it would be at once more beautiful and incomparably more durable than iron; and we might go on extending the list until we had included a great part of the metal wares classed as house furnishing goods and hardware. For a multitude of uses outside of the domestic economy gold would be invaluable. What more perfect roofing material could be desired than gold plates, or what so good for all kinds of light, out-door metal work, such as door knobs, railings, chimney caps, lamp posts and the thousand such uses for which cast and wrought iron are now employed? As a material for water pipes it would be simply perfect, remaining unchanged for centuries, and unaffected by air, water, gases, or impurities of any kind. For use in all forms of galvanoplastic manipulation it would supersede all other metals. It is the easiest of any to deposit, and the cheapest because it requires less battery power to dissolve and deposit it. For uses in larger work of many kinds it would possess many advantages over iron. An alloy of 5 parts gold and 1 of copper possesses a tensile strength of 50,000 lbs. per square inch. This is up to the average of good merchant bar. A good deal of the iron rolled into boiler plates ranges as low as 25,000 lbs. to the inch tensile strength, and very little of it honestly averages above 40,000 to 45,000 lbs. A boiler made of gold, with a strength of 50,000 lbs. to the inch, would be incomparably better than an iron boiler, for the reason that it would never weaken by internal or external corrosion, and would not be affected to an appreciable degree by the action of the fire upon it, while it would transmit heat more rapidly than any other available metal. For bridge work it would be better than iron, as it would not be affected by atmospheric influences. An alloy composed of 112 parts gold, 12 parts copper and 4 parts silver, makes what is called spring gold, a metal but little inferior to fine steel in elasticity and temper, and which might be used extensively and profitably in the arts. In a word, gold possesses a higher intrinsic value, based upon its special adaptation to a larger variety of uses, than any other metal, and were it as abundant as copper, tin and zinc, it would probably take the place of all three of these metals in general use.

It is because gold is intrinsically so valuable, and because of its comparative scarcity, that it has always been held as a "precious" metal by nations which have recognized its physical properties and appreciated its utility. It is for this reason, also, that notwithstanding the enormously increased production of gold during the past quarter of a century, it has remained throughout the world the standard of value. It is because of its almost unlimited utility in the arts that governments have to so alloy their coins, beyond the degree required to impart the necessary hardness, that they represent an exchange value as coins somewhat greater than the exchange value of the quantity of pure gold they contain. Were it not for this the gold coinage of the world would quickly disappear in the melting pots of the artisans. It does disappear to some extent even now, and coins are more or less employed in the manufacture of jewelry, cane heads, eye glass frames, etc. This fact alone seems to us conclusive proof of the absurdity of the so-called "truism" which we have quoted at the beginning of this article. We do not propose to base any financial theories on the facts we have endeavored to establish, but we shall be glad if, by presenting the question thus practically, we have aided in dispelling the fundamental error upon which so many false theories of finance have been reared.

Power Brakes.

One of the latest English papers says:

The Board of Trade inquiry into the circumstances of the Abbot's Ripton accident was resumed recently by Captain Tyler, at the Law Courts, Peterborough. Some unimportant evidence having been given, an adjournment was made to Huntingdon, to take the evidence of Enoch Cattley, the driver of the Scotch express. His evidence was simply to the effect that all signals showed white on the night of the collision. A special train was then run to test the value of continuous brakes as a means of avoiding such an accident as that at Abbot's Ripton. The train ran first to Oxford, then to Huntingdon, and lastly to Abbot's Ripton, to ascertain the distance in which it could be stopped with ordinary hand brakes. The distance was found to be 631 yards, the speed being 41 miles an hour, everyone being at his post. The train was then run back to Oxford, and then to Abbot's Ripton, Smith's vacuum brake being used. A stop was effected in 410 yards from 45 miles an hour. This is very different work to a continuous brake. An instructive comment on the danger of reversing an engine when running at full speed was supplied by the next experiment. At Fletton, near Peterborough, Captain Tyler pulled the communication cord, having previously instructed the driver to reverse his engine and use all possible means of stopping. The result was that the crank shaft of the engine was broken. We suspect that any driver who, finding signals against him, broke his crank shaft would hear a good deal on the subject of over caution; and it is not likely that drivers, with the result of Captain Tyler's trials before them, will be too anxious to reverse their engines, unless they see that a collision is imminent. So far the experiment has done more harm than good. It has placed continuous brakes in an unfavorable light, and it has proved that the risk of smashing crank shafts is so great that most drivers will be disposed to take their chance in a collision rather than run the risk of breaking down their engines.

The unconscious ignorance shown in the above paragraph is deplorable. The difference of distance in which the stopping took place is some 200 yards in round numbers, and that, too, in favor of the power brake. In these trials the train hands were in position, a thing which effects a saving of from 3 to 7 seconds, and, as the hands are not supposed to ride with their hands on the brake wheels, this should be credited to the power brake. "This is very indifferent work for a continuous brake." Yet stopping in 410 yards would have saved the second collision at Abbot's Ripton. Trains of nearly similar make up to those which went into the collision, ran 1197 yards at the great brake trials before they could be stopped by hand-power—the speeds being about the same. Yet, when the stop is made in 410 yards, the engine driver working the brakes, and without losing any valuable time, the critics of the newspapers come to the conclusion that the trial is not a favorable one. The difference which 5 or 6 seconds would make at this speed, would be equal to about 130 yards more. That is to say, under ordinary circumstances, the train could not have been stopped in less than 550 yards from the point at which the engineer discovered the danger. Reversing the engine and sanding the rails, giving the engine steam at the same time, is an expedient which no engineer who understands his business would be likely to do in this country. At a test made in New Jersey a few years ago, the gain obtained by this practice was only 18 feet, and a breakdown can be expected every time it is done. Good power brakes on the drivers and tender are all that is needed. The "unsatisfactory" character of the experiment seems to be founded on the fact that Smith's Vacuum brake was used, and not the Westinghouse Automatic. The English periodicals seem to be completely captivated by this latter complex system, and to be utterly incapable of exercising judgment in the matter. So strongly do they champion this system that their notions become a matter of speculation. Not long ago they complained that too much brake

power was not advantageous, and in the next breath praised the system which they supposed gave the greatest power. The vacuum brake can be arranged to give all the power which may be desired for stopping a train. The amount of machinery used is almost nothing, and, English opinions to the contrary notwithstanding, it is exceedingly durable. It is a very rare thing to hear of a vacuum brake that fails to work, rendering a return to the hand brakes necessary. The rubber cylinders which form such a bugbear in the eyes of the English papers, wear to all appearances longer than iron ones. It has been said that sticking a knife into one would disable the brake. This is not a fact, as the cylinder in closing also closes cracks, flaws and broken seams, and the vacuum is not impaired. Reliability is an imperative requirement in a power brake, since a system which cannot be relied upon under all circumstances is worse than none at all. The time lost in trying to apply a power brake, finding that it will not work, and calling for hand brakes, may be enough to wreck a train. If a brake sometimes fails to work, the resulting accidents are usually much worse than those which happen from the insufficiency of hand brake power. Certainty of action under all circumstances is one of the marked features of the vacuum brake, and one which it is almost impossible to praise too highly. This feature is largely due to its simplicity of construction. The Westinghouse, on the other hand, is exceedingly complex when compared with it. On each car there is a considerable amount of mechanism more than that required for the working of the hand brakes. This requires no little labor in keeping it up. On the engine, however, we have the great source of weakness, the air pump. Of all apparatuses which we have to construct, the air pump, or the air compressor, ranks with the most difficult, and one of these in this brake is mounted on the engine and has to take all the rattle and jar incident to running at high speeds. The result could be anticipated; it is frequently out of order in some way, and reliance has to be placed upon the hand brakes. The amount of labor necessary to keep these brakes in order is very great, and the cost of repair large. Another difficulty with this brake, and in fact with any compressed air brake, is the loss of time in letting off the brakes after they have once been set. Very powerful springs are required for this, in addition to the ordinary brake springs.

We think that the most perfect provision for stopping a train in case of accident, would be a combination of the well known Creamer spring brake with the vacuum power brake. This would give all the advantages of the so-called automatic brakes without their complexity or the constant necessity for repairs. In regard to the distance in which a train can be stopped, there also seems to be much error. It really depends upon the weight and speed of the train, and any system furnishes power enough to lock the wheels, or more than enough to do the work in the shortest possible time. This question is largely one of the best arrangement of brake levers and the like. The main and first questions are reliability, or certainty of action, and durability. We apprehend that after our English friends try power brakes for a few years, their opinions upon their essential features will undergo a decided change.

Taste and Art in Metal Work.

While metal workers are just beginning to appreciate high art, and are seeking for artists to produce designs for them, it by no means follows that the work which results will be artistic or in any way rival the exquisite productions of the best workmen of the middle ages. Modern manufacturers frequently wonder why their works lack a certain indescribable something which is often found in old works of even second or third rate excellence. Men have said to us "we secure the best artists we can find and employ the best workmen, and we mean to produce first-class work," yet the results are by no means satisfactory, and discouragement is often manifest. The work is not appreciated by the public, nor do artists or men of taste show the appreciation that they expected. The reason is very simple, it is an important one and can by no means be ignored: the designer must be a workman, must understand not only methods of working but the nature and capabilities of the material. A design that might be admirable in silver would, in all probability, be hideous in cast iron, and a design for a piece of wrought iron work would not look well if executed in cast brass or copper. Color, the facility of working under the hammer, sharpness of line in casting, ease of cutting or engraving, brittleness, tough-

ness, weight and many other points have their influence upon the designer who understands the material on which he works. The methods of manipulation and the uses to which an article is to be put are other elements which modify design, and unless the artist has them all in mind the result will not be at all satisfactory. Some few years ago we were called upon to design some articles, which were to be made under our own supervision. We had watched the workmen, and knew pretty well the processes involved. But when we attempted to have the design put into shape they were anything but successful. Conscious of the faults we went to the shop, and for a week spent the most of the time at the bench at work, and then found little trouble in making designs which the workmen could reproduce. We had, in fact, gained a practical knowledge of the requirements of the materials. No matter what a man's skill in design may be, if he does not understand the metal into which the design is to go, there will be a certain lack of fitness which will make itself felt, even if it cannot be put in words. There is another reason which explains why so much of beauty is lost in putting a design into metal, and that is the lack of appreciation on the part of the workman. The difference between a beautiful line and one which has no beauty whatever, is very frequently a mere nothing—so undefinedly small that one can scarcely say in what the difference consists. One man's free hand copy may, from his "feeling" for the original, render all the essentials better than another man's attempt at a fac simile. A designer who has an appreciative workman to execute will be stimulated to the utmost, the two men react upon each other and the work is of the very highest excellence. The highest possible results, however, are perhaps those in which the artist is also the workman. This should be encouraged whenever it is possible. It is not necessary that the artist should make all his own patterns or do all the ornamental work, but if he has the skill to add the finishing touches to a set of patterns, or take the file and clean up a part that needs but a touch to make it perfection, he will not only make an admirable work, but will do much toward bringing up the standard of work in the shop. It is a notable fact that the world's greatest artist in metals was also its most cunning metal worker. Designing and executing went hand in hand and were sometimes simultaneously executed. His perfect skill was at all times a stimulant to his power of design. It was master and man combined in the same individual, what wonder then that his works were almost beyond price. Some of the finest pieces of wrought iron work extant were designed by the men who blew the bellows and swung the hammer, and the same may be said of the best examples of malleable and cast iron art work.

Another point must not be overlooked, and that is the tendency to ornament too much. It is the constant tendency of uneducated taste to over do in the application of ornament. Hence the workman who has been gaining a knowledge of ornament, is constantly meeting temptations to load his productions with ornaments, so that the richness is too great. In sheet metal work this has been especially noticeable. We have had sheet metal cornices which would have been in keeping with a highly ornate Greek temple, placed upon plain brick fronts utterly destitute of decoration. This has, in fact, been the rule, and men have striven to see who would produce the most astonishing piece of galvanized iron decoration. Suit the ornament to the structure. Decorate the building, but don't make it appear that the structure was put up for the express purpose of carrying the ornaments. This over ornamentation, it is true, was a natural reaction from the excessive plainness of previous times. Public taste is getting better, and demands something more artistic, and this does not by any means imply a great deal of ornament. Water coolers are another example of the way things are over ornamented. A few years since the water cooler was a hideous tin box; to day it is resplendent with crystallized tin, transfer ornaments and wondrous striping. Solomon in all his glory was not arrayed as gorgeously as one of these over decorated coolers. Still the stunningly bright cooler is preferable to one of the perfectly plain affairs. There is an evident progress, and while the astonishing arctic scenery may not show very high art on the part of either workman, designer or purchaser, it does show most conclusively that we are moving, and in the right direction. While we criticize most sharply the horrible violations of taste which we see all about, even from manufacturers who know better, we are not at all discouraged as to the ultimate triumph of good taste over bad. Scarcely a week passes that some one in trouble about this subject of art metal work, decoration, drawing, industrial art and sim-

ilar subjects, does not apply to us for advice or information, or ask where books are to be obtained treating on the subject. The number of these applications and the earnestness of those making them, show that manufactures are thinking upon the subject and mean to progress. Fortunately, there are comparatively few difficulties in the way of obtaining better designers, better workmen and better taste. Examples of good metal work are more and more accessible. Books on art are already within the reach of the poorest working men. Schools are multiplying, and above all, the number of available teachers is increasing.

We have neither time nor space to discuss this matter in full, but we will say in conclusion that manufacturers should see that those of their workmen who want to study must have every facility. Self interest, and the interest of both State and country, imperatively demand it.

A Promise of Lower Prices for Cumberland Steam Coal.

The bill for some time pending in the Maryland Legislature, amending the Charter of the Cumberland and Pennsylvania Railroad Company, passed the Senate and, on Tuesday last, received the Governor's signature. The amendment fixes the rate of transportation on coal as follows: Four cents per ton per mile for four miles or under; three cents per ton per mile for more than four and less than ten miles; two cents per ton per mile on distances exceeding ten miles. This is a reduction of one cent per ton per mile on the respective distances from last year's rates. It is a strong point gained by the Cumberland coal companies, and, we are informed on good authority, will be followed by further savings in the cost of coal at tide water.

Hitherto the high price paid for mining and the exorbitant railroad tolls have prevented the Cumberland coal companies from successfully competing with the bituminous coals of Pennsylvania. In the Clearfield region, where the cost of mining is forty-five cents a ton—twenty cents less than in the Cumberland region—and the transportation less than one and a quarter cents per ton per mile, the output for 1875 showed an increase of nearly 100 per cent. over that of 1874, while in the Cumberland region the product fell off more than 80,000 tons.

The amendment of the Charter of the Cumberland and Pennsylvania Railroad, to which we have referred, and the very liberal policy adopted by the Baltimore and Ohio Railroad, of reducing their tolls to one cent per ton per mile, will, it is believed, not only enable the Cumberland coal companies to regain the trade lost last year, but to extend their trade in quarters hitherto supplied by anthracite.

We are glad to see this coal relieved of the heavy transportation expenses with which it has long been burdened, as it is the best steam coal on our sea-board. Its consumption will be largely increased with the reduction in its price which consumers are now promised.

Meeting of the American Institute of Mining Engineers.

(Continued.)

The next paper in order, preserving the succession, should be one by Dr. Oswald J. Heinrich, on "The Midlothian Colliery in 1876." It was a very complete historical and descriptive paper on this colliery, that has been so noted in the history of American mining engineering. An abstract of it would be very unsatisfactory. The paper was discussed by Prof. Raymond and Messrs. E. B. Cox and Rothwell. The former stated that this colliery, which had heretofore stood as an example of the difficulties, dangers and errors, is hereafter to be an example of the advanced practice in American mining engineering.

THE GEOMETRY OF CHEMISTRY.*

Prof. Wurtz, after stating his reasons for making the first public announcement of his discovery before the Institute, proceeded to say that by no means an unimportant section of the chemical world is fully ready to appreciate the pre-eminent value of studies of the kind that have resulted in this paper. Dr. Crum Brown said at Belfast, in 1874: "One thing we can distinctly see—we are struggling toward a theory of chemistry. * * * We cannot attain to a real theory of chemistry until we are able to connect the science by some hypothesis with the general theory of dynamics."

The results I shall give are no string of speculations, but a series of faithful and laborious generalizations direct from the facts and figures, not crediting myself to any hypothesis, desiring first of all to be an inductive investigator, attaching very little importance to authority, rarely taking the mean of a series of determination, but examining each figure separately.

My study of this subject began with that of thermo-chemistry. I soon perceived that not only are changes of temperature and of volume co-relative, but that changes of thermic condition are invariably concomitant with changes,

*Abstract of a portion of a paper read before the American Institute of Mining Engineers, at its Washington meeting, by Prof. H. Wurtz.

both of volume and of chemical nature. I soon turned to the changes of volume as the true index to the changes of internal molecular structure. I saw that the hypotheses in general use were inconsistent, and necessarily false. Hermann Kopp selected the boiling points as the temperatures at which volumes should be compared; or rather his expression of his hypothesis was those temperatures at which the tension of the vapors are equal. Thus each body has its own special temperature, at which its volume must be found. For a long time I held that the perfect state of matter, in which the simplest laws prevailed, and out of which all of the laws that govern even the liquid and solid states ought to be evolved, was the gaseous state. I now hold precisely the opposite view, namely, that the gaseous state is one in which expansive or repulsive energy is predominant to the point of antagonizing and nullifying most of the other laws and forces of matter; and even in the case of compound gaseous molecules, to the extreme point of incipient decomposition, or dissociation; and, therefore, that as an exceptional state of matter, the gaseous state is that least qualified to yield us a knowledge of the laws that govern chemical combination and the modes of operation of chemical energy.

Among my fundamental hypotheses was, therefore, that some definite temperature connected with the universal body, water, was a standard temperature of nature. My investigations compelled the conviction that the temperature of melting ice is one standard temperature of nature for almost, if not all, solid and liquid bodies; and I may add that the standard volume which I have discovered, and to which all combining volumes are directly referable, is that of ice at its point of incipient fusion, which point I suspect to be slightly—say one or two degrees—below the temperature of water formed by the fusion of ice.

On experimenting extensively with the volumes of Kopp, I found no satisfaction, and I determined to discover some method of arriving at the true volume of these elements in water and other common bodies at the centigrade zero. I found ultimately that the density determination of peroxide of hydrogen, 1.453, by Thénard, sixty years ago, gives us the relative volumes of oxygen and hydrogen in water. Applying certain corrections, arising from the presence of 2 or 3 per cent. of water and impurities, I found from this for oxygen very closely, 5.184 and H = 6.408. This was really the initial point of success in my investigation. By applying the new O volume to the carbonates, I speedily arrived at not only the true volume of combined carbon, equal 8 exactly, but approximately that of a number of the metals. I very soon discovered that H in hydro-carbons is a protean element. I rarely found it twice with the same volume. The whole vast fabric of organic chemistry, the chemistry of life and the endless variety of the compounds of the organic class, are due to this protean attribute of hydrogen. I have, indeed, to announce as a new, true and sharp definition of organic or zole chemistry, founded really in nature, that it is not the chemistry of carbon, as some make it, but the chemistry of hydrogen and its transformation of volume. The discovery of this law led me to new and wonderful ideas. I found that oxygen is a changeless or incondensable element in its volume, being the only changeless element. At the centigrade zero it always retains the same volume—5.184, a number having remarkable properties. Carbon and hydrogen form an elementoid group of atoms, a radical of the composition H₂C, whose molecule undergoes condensation and expansion, as a whole, like an element. I believe it is only the hydrogen in this radical upon which the condensation falls. This new radical I call homologen, from its being the agent in the production of homologous series.

Water itself, H₂O like H₂C, turns out to be an elementoid or compound radical acting much like cyanogen.

I believe I have gone far enough in my introductory remarks to justify me in passing at once to a statement of the new and great law of molecular volumes, whose discovery has rewarded my labors: THE GEOMETRIC LAW. It is: The volumes of all simple chemical molecules, whether of elements or radicals, with the one sole exception of oxygen, are expressible by quantities having, at the temperature of melting ice, the ratio of even cubes of a series of whole numbers, of which that belonging to ice, the standard volume, is 27. I call these numbers, these cube roots of the numbers, the molecular diameters, and symbolize them, for the purposes of a new volumic notation, by the Greek capital delta, Δ. In order to avoid decimals, and make the diameters integers, I substitute for the usual equivalent of hydrogen, instead of unity, the number 1000. The equivalent valent or molecular volume thus becomes 1000 times as large as they are usually stated.

The professor here gave a large number of tables, illustrating this law given above, which we have not space to copy, but which were very satisfactory. The professor also presented a number of broad generalizations relating to the geometrical laws which govern matter and its energies, which it would scarcely be appropriate for us to state in the absence of the tabulated facts and figures referred to above, which demonstrate their truth.

MODERN AMERICAN AND EUROPEAN TUNNELING.* Mr. Drinker stated that for over a year past he had been engaged in collecting materials for a general treatise on modern tunneling, the work being commenced about the time he presented to the Institute his paper on the Musconetcong tunnel, published in Volume III of the transactions.

The attention of members was called to the fact of their being absolutely no general work in the English language on the subject, the

*Abstract of a paper read by Mr. Henry S. Drinker, of Phila., at the Washington meeting of Am. Inst. Mining Engineers.

only publications being Mr. Simms' report on the construction of the Saltwood and Blechnally tunnels in England, in 1841-2; also, certain papers read before the English and American societies of engineers. Mr. Drinker adverted to the fact that previous to the establishment of our American societies of civil and mining engineers it would have been almost impossible for any one to have established the necessary communication with engineers throughout the country, but that now the collection of data for a thorough resume of the subject was rendered practicable, the means of communication being at hand.

The scope of the work would cover not only the history of American tunneling proper, but arrangements had been made abroad for full returns up to date of European work. Detailed descriptions would be given of the various methods of tunneling—the American, English, French or Belgian, German, Austrian, and other systems of soft and hard ground mining, largely illustrated, with tabulated lists under each head of such data as could be gathered of the cost, length, rate of driving, method of construction, &c., of tunnels built under such systems, the work being intended not only to give to engineers a general summary of the past history and present status of the art of tunneling, but also to supply the need, so long felt, of an English text book on the subject.

Mr. Drinker concluded by presenting the following list of general questions, with a request to members who might be interested in tunnel work to consider them, and, if practicable, to furnish information on the points noted. Any data solicited concerning railroad tunnels or mining tunnels, headings and drifts, as to their—

1. Location, length, date, time occupied in building, &c.
2. Names of engineers and contractors.
3. Nature and characteristics of material passed through.
4. Cross-section adopted through rock where self-supporting; and if loose, method of timbering and cross-section of masonry.
5. If through rock, whether top or bottom heading driven, with the rate of progress and size of heading; whether driven by hand or machine labor. If by hand, number of men generally employed on a shift, and number of shifts per day preferred. If by machinery, what make of drill and compressors adopted.
6. If drilling by hand or machine labor, estimate of cost per cubic yard or lineal foot, or both, of heading and enlargement. If work commenced by hand labor, and machinery subsequently put in, relative rate of advance and relative cost.
7. What explosive used, and any details as to amount burnt per cubic yard of rock broken in heading and enlargement.
8. Manner of working, and rate of advance of enlargement in rock.
9. If through soft ground—i. e., clay or deposit—size, rate of advance and manner of driving, timbering, &c., preliminary (top or bottom) headings, with details of subsequent enlarging and arching. Cross-section of masonry adopted; description of stone, brick or cement used.
10. Final grades and drainage adopted.
11. If shafts or slopes used, any details concerning their size, material passed through, rate of progress, &c.
12. What depth of open cut deemed advisable at either extremity (rock or earth cut) before beginning to tunnel.
13. Price paid, or final cost, per cubic yard of tunnel and shaft excavation.
14. Price paid, or final cost, per cubic yard of tunnel masonry.
15. Total final cost of work.

Lastly, if this should reach the hands of any gentleman not personally connected with tunnel work, any information whatever, bearing even most remotely on the subject, is requested—i. e., the locality of any tunnels, naming the railroad or mining district, so that specific information may be sought; or reference to any publications on the subject of tunneling, whether in scientific periodicals (American or foreign), or even in the daily papers.

Address Henry S. Drinker, Mining Engineer, 1906 Pine street, Philadelphia, Pa.

WHAT STEEL IS.

Remarks by Frederick Prime, Jr.:

The writer in this article first calls attention to the definition of steel which has hitherto been accepted, viz.: That it is a malleable iron that will temper, and possessing great tenacity, weldability and malleability, both hot and cold, when not tempered. He shows that it is the view held by Karsten, Gruner, Percy, Tunner, Siemens, Wedding and Kerl, who are the leading European metallurgists.

Mr. Prime defends the retention of this definition:

1. Because it excludes cast iron.
2. Because it excludes malleable iron, which does not appreciably harden when tempered.
3. Because it includes all malleable irons possessing the properties before mentioned, whatever the process by which they are produced.
4. Because it is scientific, since it classes together bodies possessing similar properties, and excludes those which do not have them.
5. Because it is practical, as a good smith can readily distinguish steel from wrought iron, and classify the different grades of steel.

There are many objections to Mr. Holley's definition, "that all the compounds of iron which have been cast in malleable masses are called steel, the term wrought iron being still confined to malleable iron made from party masses, and hence laminated in structure." His definition is practically that of Greiner, Phillips, Jordan and Hackney. Among the objections are:

1. The pirating of the old term steel, instead of inventing a new one that will comprehend all the cast, malleable or ingot irons.

2. Because much of what has hitherto in common practice been recognized as steel will be relegated to wrought iron, not on account of its properties, but of its method of manufacture.

3. The proposed definition will include some varieties of cast iron.

4. Because a considerable range of the steels will be unrecognizable from the wrought irons (by the proposed definition of Holley), by their practice, bending or other usual quick mechanical methods.

Lastly, The fallacy of Holley's definition is shown in that it is based on purely mechanical distinctions, and not chemical ones. And, in conclusion, it is shown that the proposed definition of Holley's is advocated by mechanical engineers, backed by manufacturers of Bessemer and Martin products, while the old definition, whose origin is lost in obscurity, is defended by the prominent metallurgists, who it is claimed are the more competent authorities.

DISCUSSION ON THE ABOVE.

Mr. E. B. Cox:

The difficulty through all this discussion seems to be one of words and not of things. Only one thing, one substance connected with the question at issue is absolute, and that is iron itself, and carbon, phosphorus, sulphur, etc., are impurities. The real practical question is not what shall these different substances be called, but what shall be the proportion of these impurities to make iron applicable to certain uses? We cannot have an absolute steel, or an absolute cast iron, or an absolute wrought iron. We cannot say when absolutely one of these leaves off and the other begins. It is only pure iron that is absolute, and the problem for the engineer to decide is the amount of carbon necessary to be mixed with this iron to fit it for certain uses.

Mr. Frank Firmstone:

I would like to ask what is the objection to the old definition of steel; that it is a product that will forge, harden and temper.

Prof. T. Eggleston:

I would like an answer to the question laid over from a previous meeting. In France it was necessary to make a wrought iron wheel. Experiments were made, and wrought iron was tested physically and chemically. It was then fused and cast, and it was still wrought iron. Now why in one case was it steel and the other iron? If more fusion made it steel, then we must throw out the chemical part of the definition. Until we can have some definition that will not include absurdities, I must adhere to the old one.

Mr. A. L. Holley could answer Prof. Eggleston. Mr. Metcalf took wrought iron, carefully tested it, then melted it and poured it, and both its physical and chemical characteristics were changed.

Prof. Eggleston thought it was necessary to supplement the physical test with chemical.

J. B. Pearce:

If in the fusion the iron is carefully excluded from carbon, it will be kept iron.

Prof. J. Lawrence Smith referred to a specimen of pure iron obtained from England. He had found that if this iron in fusing is protected from gases containing carbon, it will retain its character of iron.

Mr. J. B. Pearce had two objections to the definition of Mr. Holley. 1st. In place of an old one it is new. 2d. In the nature of things it has no foundation. The same difficulty would be found in making a definition of steel that would include wrought iron and cast iron; that the brass founder would have, in defining brass to include gun metal or bronze to include brass. My opinion is that there is a sharp dividing line between steel, wrought and cast iron.

Prof. Stillman:

Whenever any impurities are in iron its character is at once changed, but when pure, it remains an integer. To prove this, Prof. Wurtz has kindly furnished me with some figures of density as given by Prof. Carron.

Iron pure, 16", fused.....7.833
Iron wire.....7.847
Iron hammered.....7.868
Iron fused in H.....7.88

The diversity of phenomena, when bars have been hammered, etc., is due to impurities.

Traveling Salesmen in Maryland.

The Maryland legislature still believes in its right to impose a license tax upon traveling salesmen selling by sample in that State, and notwithstanding the decision of the United States Supreme Court that such a tax is unconstitutional, they have a bill under consideration which reimposes the license tax, and imposes penalties upon all who are caught selling by sample without previously paying tribute to the State treasury. We are glad to see that the Baltimore Board of Trade has protested against the enactment of such a law, which can have no other effect than to impose upon traveling salesmen from other States the trouble and expense of further litigation in defense of their rights, as already defined in a test case under the old law, by the United States Supreme Court.

Since writing the above we have received a report of a recent trial in one of the criminal courts in Baltimore, which serves to show the extent of the annoyance to which commercial travelers in Maryland are subjected.

Mr. W. C. McCarty, a traveling agent of Henry Mayo & Co., of Boston, was charged with selling goods without a license. The fact that McCarty has no license was admitted by the defense. It was claimed by the counsel for the defense that non-resident traders were not required to pay any license. If this operated as a discrimination against home traders it was the fault of the legislature. Section 37 of article 56 of the Code of Public General Laws, under which non-resident traders had been compelled to pay a license, had been declared

to be unconstitutional. If additional legislation had not since been consummated requiring non-resident traders to pay the same license as home traders the fault was with the General Assembly.

Judge Gilmor, in rendering his decision, referred to the case of Ward vs. Maryland. Ward had been convicted in the criminal court of selling goods without a license, and sentenced to pay a fine. The decision was sustained by the Supreme Bench of Baltimore city and the Court of Appeals of Maryland; on an appeal, however, to the Supreme Court of the United States the provisions of the Maryland Code under which Ward was convicted were declared to be unconstitutional. McCarty, the accused party in the present case, was in the same position as Ward, and was now sought to hold him under the General Traders' License Act.

The court thought that the forty-first section of article fifty, Public General Laws, quoted by the State's Attorney, rendered non-resident and resident traders alike liable to pay license. It seemed to the court that McCarty was placed upon the same footing with resident traders, whether he is residing here temporarily or permanently. It certainly was not the intention of the Supreme Court to interfere with the right of a State to impose the same regulations on non-resident traders. Judge Gilmor, in conclusion, said that the alleged violation of the law by McCarty had, in the opinion of the court, been sustained by the proof. As it was the first time the court had been called upon to construe the law in question, it would impose the smallest fine, \$20.

Cutting Files by Machinery.

One of our leading commercial journals contains the following, which may be taken as a sample of the kind of manufacturing news which "goes the rounds" most rapidly:

"A Boston party has succeeded in inventing a process for manufacturing steel files by machinery, which would appear to dispel existing doubts as to the practicability of the undertaking. The machinery is constructed in a manner that makes the process of manufacture an identical imitation of the process of cutting by hand. We have seen no statement as to the number of files that can be produced in any specified period of time, and consequently can give no estimate of the advantage of the machine over the hand work in this respect, but it is certain there would be but little notice taken of the invention unless it contained this advantage. A machine of this kind, if a complete success, will certainly reduce the price of files."

The first American machine for cutting files of which we have a record at hand at the time of this writing was invented by Morris B. Belknap, of Greenfield, Mass., and patented January 16 and June 13, 1812. Since that time the industry of making machine cut files has been prosecuted with varying activity. A number of companies, large and small, are engaged in the business, which is now well established on a firm basis, and has already attained extensive proportions. In England files were cut by machinery as long ago as the middle of the last century, but the natural seat of this industry seems to be in the United States. We are glad to learn that a new, and possibly an improved, file cutting machine has been invented, and hope it will be useful; but to herald it in the above extravagant fashion is, in view of the facts of the case, absurd.

Rumored Changes in the Canadian Tariff.—The Montreal *Gazette's* Ottawa correspondent says: "There are rumors that the government is contemplating some changes in the existing tariff, and it is not unlikely that the announcement will be made in a few days of important changes in sugar duties, having in view the double object of encouraging the West India trade and building up a refinery industry in the Dominion." This is a step in the direction of protection of home industry, but we incline to the belief that it will require more than a protective tariff to offset the disadvantages of a scant population, limited resources of raw materials, a severe climate, and a general lack of enterprise which characterize the people of Canada. The efforts to increase immigration into the provinces has hitherto resulted largely in benefit to the United States, as a very large percentage of the immigrants entering Canada have drifted over the line and found permanent residence on this side of it.

Centennial Railroad Fares.—At the Convention of the General Railroad Ticket Agents of the United States, held at New York on the 8th instant, to fix the rate of fares for the Centennial, it was decided that from the territory east of Detroit, Toledo, Cleveland, Crestline, Columbus and Cincinnati, and west or north of (including) Binghamton, Elmira, Corry, Pittsburgh, Wheeling and Parkersburg, excursion tickets to Philadelphia and New York be made good for thirty days from date of issue; that a reduction be made of not more than 25 per cent. from Convention rates to Philadelphia for round trip tickets by the way of direct routes; that the rates on tickets to Philadelphia by the way of New York, returning by the same route, be \$2 more than the rates to Philadelphia by the direct or short line; and that the rates on tickets to Philadelphia by the way of New York and returning by the way of a direct or short line, and vice versa, shall be \$1 more than the rates by a direct or short line to Philadelphia.

The Meriden Britannia Co. have finished silver plating a plow, which is to be exhibited at the Centennial by an enterprising Michigan firm. We hear of another manufacturer of agricultural machinery who proposes to exhibit a \$10,000 mowing machine. We hope these costly toys are not fair samples of what will be shown at our great exhibition.



MANILA Water Pails.

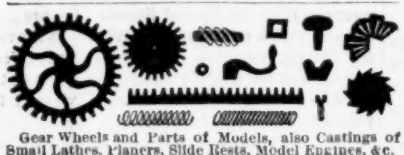


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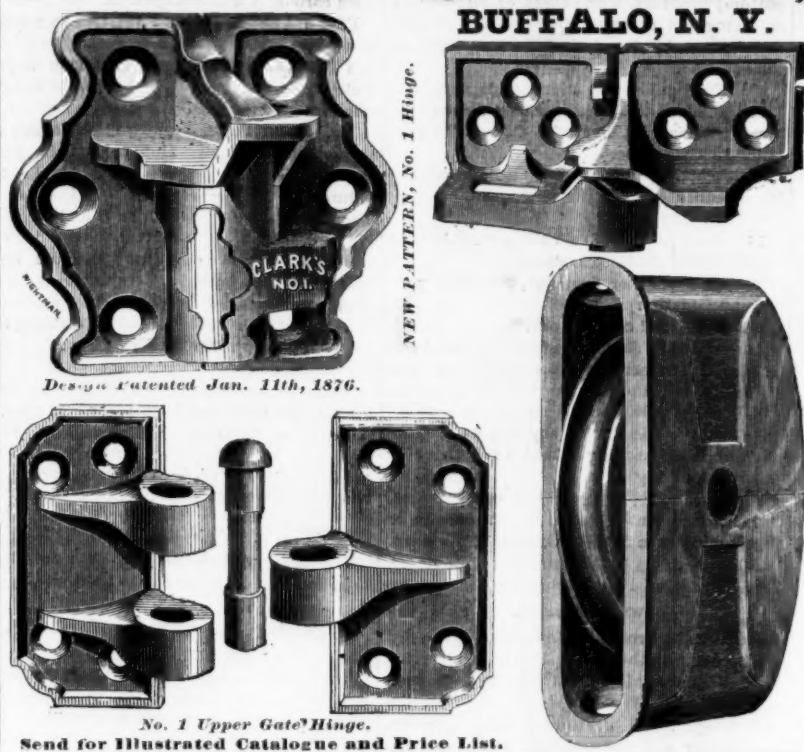


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It has been adopted and is in use in the principal parks and all the other City Parks, New York; Government Grounds and City Parks, Washington; Boston Common, Boston; Prospect Park, Brooklyn; and on almost every prominent Park throughout the United States and Canada. Four sizes for hand-power; four sizes for horse-power.

Prices from \$14 to \$200. EVERY MACHINE WARRANTED.

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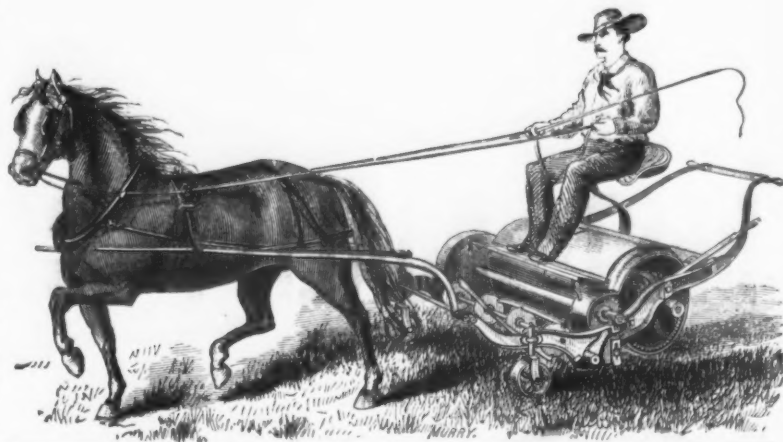
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The Great Trial.

At the trial held in New York city, on the 25th of June, 1874, the New Excelsior was awarded the First Premium (a Silver Medal) by the American Institute, in competition with all the different Lawn Mowers now made in this country.

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This Proves THE EXCELSIOR the best Lawn Mower in the World.



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Exact Model of S. & W. No. 1 and No. 1-2 Revolvers.

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For marking boxes, barrels, bags, and packages for shipment. Printing all manner of showcards, notices, signs, numbers, prices, &c., and other purposes too numerous to mention. Instructive and amusing for boys.

WHOLESALE PRICES.

Size.	per dozen.	per dozen.
1/2 in.	\$6.00	1 1/2 in. \$10.00
3/4 in.	6.50	2 in. 12.00
1 in.	7.00	2 1/2 in. 13.00
1 1/4 in.	9.00	3 in. with lower case. 15.00

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A. A. POPE, Sec.
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EASTERN DISTRICT,
E. B. TUTTLE, Treas.
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A New Tool.

Patented Aug. 10, 1875.

We beg leave to call the attention of Dealers in Tools and Hardware to this new

PIN VISE.

This cut is about two-thirds size. It is of metal throughout, jaws forged steel. The workmanship is first-class. It pleases workmen and amateurs.

Price per doz. Polished...\$18 00
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Worcester, Mass.

FOR SALE.



at 10c. a copy, Weekly Spanish Review and Prices Current. The undersigned is also a Translator from and into the English, Spanish, French and German. Latest Translations made: for the governments of Germany and Spain, Pacific Mail S. S. Co., Walter A. Wood; Morris, Wheeler & Co.; Todd & Rafferty; John T. Dunkin; Fisk & Hatch; H. W. Wilde; Wilson Sewing Machine Co.; J. Hess & Co.; H. Marguardt; M. Echeverria & Co.; and Chas. E. Little, New York; Hooking Valley Mfg. Co.; W. F. Potts, Son & Co., Phila.; Atlantic and Pacific Land Co.; B. E. Flemming, Jersey City; Wilder & Co., Savannah, and the Tanite Co., Stroudsburg ("Emery Grinder"), to whom he refers.

Estimates furnished of translations and setting up of Spanish, German and French Catalogues for the Centennial.
C. KIRCHHOFF,
Metal Reporter of "The Iron Age,"
Box 3091, New York P. O.

English Built Steamers for the Pacific Mail Steamship Company.

The mail contract between the government of New South Wales and the Pacific Mail Company is for eight years, and the amount of the subsidy annually is £20,000. The company intends to place on the route three steamers—the City of San Francisco, the City of New York and the City of Sydney. Between Sydney and the Fiji and New Zealand, English steamers will carry the mails, and the following extract from the *Illustrated London News* shows that these vessels are completed, and that one has sailed:

The dimensions of the Australia are: Length, 376 feet; beam, 37 1/2 feet; depth from base line (bottom of floors) to spar deck, 28 feet 8 inches; depth of hold from top of floors to main deck, 19 feet; tonnage, about 3000, British measurement. The engines, of 500 horse-power, nominal, working up to 2400 horse-power, effective, are compound, with two cylinders of 62 inches, and one cylinder of 45 inches in diameter; stroke, 4 feet 8 inches. There are three cranks instead of two, as is usual in marine engines, and the result is a steady, quiet movement, almost inaudible in the saloon, even when the engines are working at high speed.

The sleeping cabins for the first-class passengers are of a very superior character, most of them being placed on the main deck, forward of the spacious dining saloon. A number of state rooms on the upper or hurricane deck are arranged for two passengers only, while a few are admirably adapted for families. They are covered by a light and elegant deck, affording an elegant promenade for passengers during the day time, and projecting sufficiently over each side to provide an awning for the cabins and a roomy sheltered walk. The windows and Venetian blinds, with which these cabins are fitted, must make them exceedingly light and airy. The dining saloon is very handsome, extending across the ship from side to side, with four tables running fore and aft the entire length. It measures 60 feet by 38 feet, with 16 inside doors, and is lighted and ventilated by a lofty, dome-shaped skylight, which is one of

the most striking features of the ship. Contrary to custom, the saloon is placed forward of the funnel, thus escaping the smoke and heat from the engine room. The Australia has accommodations for 164 first-class, 24 second-class, and 85 third-class passengers.

The Australia and her sister ship Zealandia were built specially for the Australia and San Francisco service by John Elder & Co., Glasgow. The Zealandia sailed from Plymouth for Melbourne on the 19th of December, and was spoken at St. Vincent, Cape de Verde Island, on the 28th of the same month, having made the run in 8 days and 17 hours, being an average of 12 nautical miles an hour. She was expected to make the voyage to Melbourne comfortably in 43 days.

A smooth polished block of pure silver, weighing 4200 pounds, and worth \$64,000 in gold, has been brought to this city in the steamer City of Havana. It is a foot in thickness, and has three sides, each three feet in length. It belongs to Pio Bermujillo & Co., bankers, of the City of Mexico, who have consigned it to Gomez, Rionda & Co., of No. 90 Old Slip, to be exhibited among the Mexican products at the Centennial.

The House Committee on Patents has reported adversely on the application for an extension of the patent on what is known as the four-motion feed in sewing machines. The continuance of this patent has been the cause of keeping up the price of all sewing machines in this country, and the effect of this refusal to extend the patent will ultimately, it is thought, reduce the price of sewing machines at least thirty per cent.

We are glad to learn that Mr. L. S. Durfee, secretary of the Pneumatic Steel Association, is convalescent. About two months ago he fell and broke his leg, the accident resulting from a momentary loss of consciousness. He is now around on crutches.

The Bergen Iron Works, at Jersey City, are offered for sale. It is a small rolling mill, desirably situated. The property will be sold either with or without the machinery and buildings, or it will be leased for its present uses for a term of years.

H. D. SMITH & CO.,

Plantville, Conn.,

Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

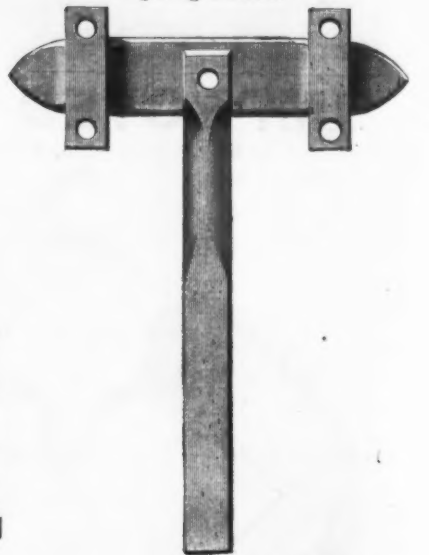
Patent Whiffletree Bolt,
Bent Pattern.

Smith's Patent Noiseless Shaft Couplings.

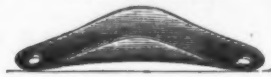
The Steel Lined Rubber makes this the Simplest, Most
Durable, Effective Anti-Rattling Coupling made.



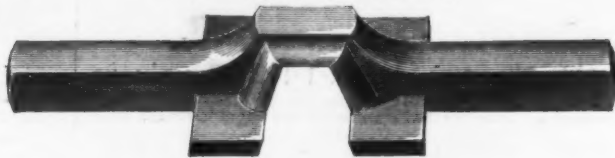
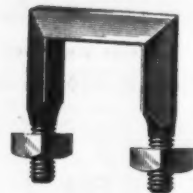
Spring Brace.



Felloe Plate.



Patent French Coach Clip.

Short Spring
Clip.New York
Slat Irons.

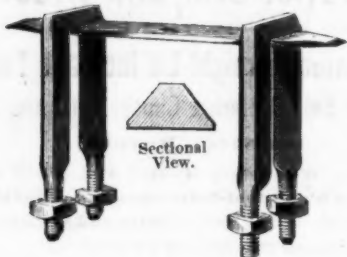
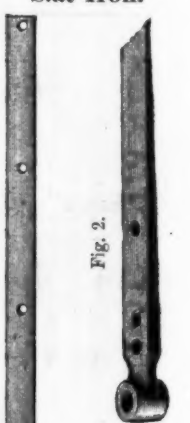
Saddle Clip, Octagon Pattern.



Plain Pattern Axle Clip.



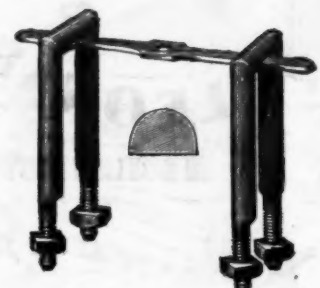
Saddle Clip, Skeleton Pattern.

Philadelphia
Slat Iron.

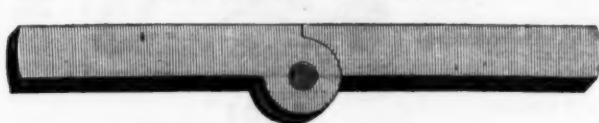
"The Anvil" Axle Clip.



Spring Bar Clip.—Smith's Pattern.



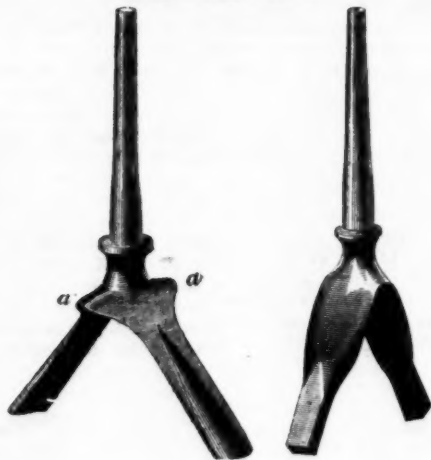
Smith's Milled Stump Joint.



Axle Saddle Clip.



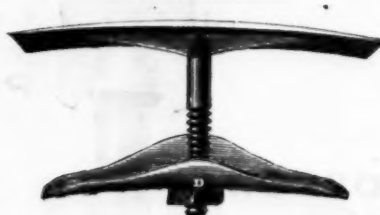
Clip King Bolts.



Improved Shaft Bolts.



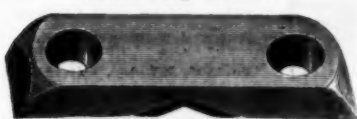
Felloe Holders.

Brewster & Co. Patent
Whiff Plate.

Loop Yoke.



Axle Clip Yoke.



Safety Loop.



Coach Axle Clip.



Cross Bar Step.



King Bolt Yoke and Brace.



5th Wheel Anti-Rattler.



Thomas Top Prop.

Brewster & Co. Pat.
Felloe Joint Bolt.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

SEND FOR PRICE LIST.

One Cause of Demoralization in the Iron Trade.

No. 98 LIBERTY STREET, New York, March 10, 1876.

To the Editor of The Iron Age: Your remarks in yesterday's issue upon "Manufactured Iron" and "Blue Spectacles," contain wholesome facts which must be realized and acted upon, without doubt. Permit me to call your attention, however, to one direct and sufficient cause for the "panic within" among iron manufacturers, operating especially upon Western manufacturers, namely: their indiscriminate quoting of prices to all sorts of buyers, in efforts to control trade belonging legitimately to others. Pittsburgh and other Western manufacturers have not been satisfied with a division of the merchants' demands as against Eastern mills, nor with a share of heavy consumers' orders, but as the times have grown worse have sent agents into every town and hamlet, in ridiculous and contemptible efforts to sell small consumers and retail country dealers. The results have been disastrous, of course. Eastern mills have thus been forced to pursue a similar policy, and Eastern merchants have consequently been, and are now, compelled to sell a pair of shoes or a blacksmith's bundle of iron as cheap as they can buy a hundred tons. They have been deliberately deprived of the larger orders of course, except where such trade is held at mill prices. A more lamentable exhibition of the policy of "killing the goose that lays the golden eggs," has not been seen, and yet, as the facts are, the policy appears to have resulted more to the injury of the manufacturers than the merchants.

As a rule, merchants are independent of any one grade or variety of stock. Their business (quite as legitimate, as honorable and as necessary to trade as the manufacturers) being to combine in one stock the products of various mills and factories, all of which they can sell at a small margin on cost, to the very great advantage of the consumer. For instance, an iron merchant will sell and divide his expenses over refined, common, rivet, angle, tee, and other forms and qualities of bar iron. His stock will include Norway and Swedish irons, steel of tool, machinery, tire, toe calk and other grades, bolts, nuts, washers, boiler rivets, railroad spikes, horse shoes, &c., &c. He will also sell boiler, tank and other plate iron, and perhaps, also hold agencies for beams, girders, gas and water pipe, &c., &c.

The results are as seen—while mills are failing in all directions, few failures occur among merchants. The dishonorable and suicidal mill policy is, however, driving out of the business, of their own accord, in proper disgust, some of the most eminent and respectable iron merchants of the country, to the ultimate loss of consumers whose necessities are met in merchant stocks, and to the injury of the mills, who thus destroy their best and cheapest medium of securing such trade. The amount of money spent by manufacturers in efforts to obtain impossible trade, which in normal times they could not and would not supply, would have made a handsome profit to the merchants. Moreover, by mills keeping away from such buyers, merchants would be able to obtain better prices, and make a small profit. As it is, the mills kill the merchants' trade, so far as possible, and thus injure themselves in two ways directly: 1st. They spend money fruitlessly, unable to hold such trade; and, 2d. They must afterward sell merchants at less than they quote consumers. Thus they have been foreign reductions on themselves for 18 months past.

There are merchants with capital, experience and pluck who will not and cannot be driven out; and the remarkable fact is seen that merchants are selling bar iron in New York and Boston and Philadelphia as cheap as best makers can manufacture it in Pennsylvania. Of course, by pursuing a policy which bankrupts their own fraternity, they give merchants the advantages of bankrupt stocks, and enable them to buy of falling concerns below cost.

It is time rolling mill men were taught by facts the nonsense and folly of driving merchants out, who are, in the long run, the safest and best and largest customers they can have, if properly and honorably protected by a fair and wise discrimination in prices.

A very large part of their troubles will disappear when they join in an effort to reach just the iron business into the legitimate channels.

The manufacturers who, like Messrs. Tuckerman, Mulligan & Co., Ulster Iron Works, and Messrs. H. Burden & Sons, Troy, N. Y., recognize the necessity and the advantages of merchant connections and support, are wise.

Yours, truly, E. P. WILLIAMS.

British Iron Trade Statistics.

In his inaugural address as President of the British Iron Trade Association, Mr. George T. Clark, of the Downhills Iron Works, explained the anomalous condition of the English iron trade, which, compared either with that of France or of America, is singularly barren of proper statistical returns. We have already drawn attention to the admirable completeness of the Annual Report of the American Iron Trade Association, and are gratified to find Mr. Clark expressing a hope that the English Association may be enabled to rival that of America "in the value and completeness of the information" brought forward from time to time. The American Association, we may add, publishes, in addition to its valuable annual report, a weekly Bulletin, devoted—perhaps, in the matter of protective duties, too much devoted to the interests of the iron trade; but, at any rate, reflecting facts, observations and opinions on questions having reference to the purposes of the Association. The French Iron trade is

represented by a similar body, whose transactions appear periodically as the Bulletin du Comité des Forges, a valuable publication, full of facts and statistics of the French trade, both internal and with other countries. Associations of a like character exist in Belgium, Prussia proper, Westphalia and the Rhenish provinces. These organizations are all in full activity, and excite a feeling of astonishment that England, who produces nearly as much iron as all the rest of the world put together, possessed, up to the very recent date of the foundation of the Iron and Steel Institute, no national organization of the iron trade at all!

The answer appears to be that until the introduction of railway communication and joint-stock companies had decentralized raw material and capital, the English iron trade—as yet comparatively small—was in the hands of a few great capitalists, who, caring little for publicity, sometimes competing with each other and sometimes combining together, carried on their business in the main with remarkable success. The iron master of the olden time confined his attention closely to the details of his manufacture and to the sale of his metal at the nearest port. The Guests and Crawshays, the Knights and Bairds were territorial magnates, whose attention was focussed on their own domains. The existence of iron works depended on the proximity of river or canal, and the convenient juxtaposition of ore, flux and fuel. If the fuel were all consumed or the ore gave out, the iron master could by no means call in the resources of another district to redress the shortcomings of his own; he had the simple option of moving to another place or of retiring from business altogether. Iron production was, in fact, a purely local industry, and as such, invested the iron master with greater attributes of power than were possessed by producers of other goods. With the spread of the railway system, the rapid increase of wealth and the formation of joint-stock companies, all the traditional grandeur of the iron master departed. The lords of the blast furnace found themselves suddenly brought into violent competition, not only with each other, but with the new men and new companies attracted toward the iron trade by the large fortunes made by their few predecessors. Improved means of communication developed new centers of production, and original advantage of position was often counterbalanced by the construction of a railway. Furness and Cleveland may be cited as an instance of entirely new iron districts springing suddenly up to compete against counties which had grown rich on their natural advantages. At the present moment Scotland, with her own vast iron production, imports Cleveland pig into Grangemouth; Sheffield, surrounded by her own blast furnaces, draws iron from Russia and Sweden, from Barrow and Derby; Staffordshire imports pig iron from distant Middlesbrough; Lancashire, despite her large local production, buys iron from Cleveland, Derby and Lincolnshire, while South Wales takes shipments of hematite pig from Barrow, and imports ore from Spain, Northamptonshire and Furness. Full of interest as are the facts thus badly stated, we may safely affirm that they do not convey any but the faintest idea of the vast and complex problems suggested by the iron trade under its present conditions of existence. A slight advantage in wages or in communications may enable the iron masters of one county, who have to fetch their coal from a distance, to undersell those who literally stand over that indispensable material, but find it unprofitable to raise it for manufacturing purposes. At the moment of writing, the iron makers of Staffordshire are talking of blowing out more of their furnaces, while long trains convey the coke of Durham to Cleveland, whence pig iron is poured into other districts at prices so low that local makers give up competition in despair.

It is toward the collection of facts and figures illustrative of these phenomena that the efforts of the British Iron Trade Association will be primarily directed. It is by no means beside the purpose to remind the members of the new society that, on the care bestowed in collecting facts and figures the value of the work will entirely depend—and we may also remark that this work is performed in America—not by government officials—but by the members of the association. The work of collection performed, then commences the task of putting the figures in such compact and manageable form as will render them practically useful, or, as Mr. Clark characteristically puts it, "the mere collection and publication is but a part of what is wanted. The figures are the raw material, which it would be our business to smelt and refine. We must use them as means to an end; and upon the manner in which they are handled and the soundness of the conclusions drawn from them, will depend, in a large measure, the usefulness and character of our body."

In addition to the collection and arrangements of statistics, the association will consider the commercial and legislative conditions of the iron trade. Protection of home industry is at this moment the cry of Continental and American iron masters, and Russia—as Mr. Clark points out—"seems following in the same track." In France, Belgium, Germany and the United States, specific interests are permitted to outweigh the general good; and, although many years have passed since England constituted herself the apostle of free trade, she has, up to the present, secured but a slender following. Nevertheless, there is no reason to despair. In America, the most obdurate of all protectionist countries, there are indications that reason is gradually making head against prejudice and the influence of wealthy manufacturers. Europe, however, presents some discouraging symptoms, as in the case of Spain. English capital has been largely invested in Spain in opening iron mines and in

forming connections with the port of Bilbao, and yet the Spanish government took occasion, when that quarter of the country was convulsed by insurrection, to lay an export duty on a trade which can bring nothing but wealth and prosperity to the country. In facilitating the removal of silly and vexatious imposts, such as that just cited, good service may be done by a body representing a gigantic industry; and in bringing pressure to bear upon the railway companies, to ensure greater equality in the conditions of transit, the British Iron Trade Association has ample scope for the exercise of diplomatic talent. But we must again raise a warning word against the weakness of permitting a purely trade association to be drawn into lengthened discussions of the questions at issue between capital and labor.—Iron.

Special Notices.

Important to Manufacturers.

HISSELL, WELLES & MILLET, Auctioneers and Commission Merchants, No. 15 Murray St., New York.

Solicit for Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

Wanted.

A party of some means to patent and introduce in Great Britain and Canada a beautiful article in the Hardware and House Furnishing line. Just patented in U. S.

H. & H. F., Box 2279, N. Y. City.

SITUATION WANTED.—By a thoroughly practical man, to build or manage blast furnaces or an iron foundry. His plans for blast furnaces embrace the best modern improvements. Good references. Address

IRON, Cartersville, Ga.

For Sale.

The Patent of R. H. Hasenritter's Portable Show Case, described and illustrated in the January 1, 1876, issue of the Scientific American, in the whole or in parts. Address

R. H. HASENRITTER, Herman, Mo.

EMPLOYMENT WANTED.—By a Civil Engineer and Mechanical Engineer, with a thorough technical education and practical experience in bridge building and machine construction, and in designing and draughting bridges and special machinery.

C. S. B., Address P. O. Drawer 9, Wolcott, N. Y.

CENTENNIAL EXHIBITION.—The undersigned, a German, having been engaged by Messrs. Siemens Brothers, of London, England, the great table Manufacturers, to represent their interests at the coming Centennial Exposition—which will occupy but a small portion of his time—would be pleased to arrange with some other firms to represent their interests at the same time for this occasion. Terms reasonable. Refers to Messrs. W. B. Beumt & Son, of Philadelphia, where he was formerly engaged. Please address

H. BORCHERS, Mech. Engineer, 656 N. 12th St., Philadelphia.

The Champlain and Essex MINING CO.

GEORGE G. SAMSON, President, 69 William St., Box 93, New York P. O.

LEWIS B. BOE, Supt. and Manager, Fort Henry, N. Y.

Offer For Sale on shipment on and after 15th day of May, Magnetic Iron Ore from their mines.

Analysis Made by J. Blodgett Britton shows:

Pure Metallic Iron.....	57.48
Oxygen with the Iron.....	41.90
Water.....	.48
Insoluble silicious matter (white sand).....	15.79
Soluble silica.....	.43
Sulphur.....	.02
Phosphoric Acid.....	.42
—Oxygen.....	54.96
Alumina.....	.78
Lime.....	1.59
Magnesia.....	.08
Oxide of Manganese, undetermined matter and loss.....	.49-100

CENTENNIAL EXHIBITION.

A young man, a native of this city, with good references, having had large experience in the Hardware Trade, offers his services in receiving, arranging and keeping goods in order during the exhibition. Terms moderate. Address

JOSEPH E. PARKER, 461 North 2nd Street, Philadelphia.

VENTILATING & STEAM HEATING.

A thoroughly competent engineer, with extensive experience in the above line, desires employment.

Address

Office of The Iron Age, 10 Warren St., N. Y.

Business Opportunities.

New Capital Procured, Partnerships Arranged, and Commercial, Mining and Banking Corporations Organized, by

CLARKE, CHITTY & CLARKE, Board of Trade Offices, New York. P. O. BOX, 4071.

A. PURVES & SON,

Corner South & Penn Streets, Phila., Dealers in

Scrap Iron & Metals, Machinery, Tools, Shafting & Pulleys, Steam Engines, Pumps & Boilers, Copper, Brass, Tin, Rabbit Metals, Foundry Facings. Best Quality Pigot Brass. Cash paid for all kinds of Metals and Tools.

DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors, 101 & 103 Duane St., N. Y.

Special Notices.

SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Angers and Bits, each running seventeen years; dated as follows: Dec. 19, 1865; January 31, 1866; and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law.

Russell Jennings, DEER RIVER, CONN., Sept. 7, 1874.

WANTED TO PURCHASE, 100 tons good Second-Hand T Rails, 18 or 20 lbs. per yard.

Address, giving particulars,

PIPER & THOMPSON, Lapeer, Mich.

TO LET, A Light, Handsome Office.

Possession Immediately.

HERMANN BOKER & CO., 101 Duane Street, N. Y.

MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 3 lines, 3/; every additional line, 10d. Price, 6d. per Copy, or 30, per annum, inclusive of postage to the United States.

HALL & HARBESON, Manufacturers of Chemical & Physical Instruments, 191 Greenwich Street, N. Y.

SPECIALTY.—BURNER'S GAS BURNERS, for all heating purposes; BURNER'S IMPROVED GAS CONSUMERS; Furnaces, with 10, 15 and 25 burners. Fine Brass and Metal Work made to order for Metallurgists, Chemists, Experimenters, Colleges, &c.

Steel Castings.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for cast iron in all cases where great strength is required. Send for circular and price list to

CHESTER STEEL CASTING CO., Ecclesina St., Philadelphia, Pa.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy.

A practical man with means is wanted to join a practical man who is already well established.

Address

CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.

Briesen's Patent Agency

FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA AND EUROPE.

No. 258 Broadway, New York.

A. V. BRIESEN.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address,

IRON AND STEEL, Care of P. O. Box 813, Bridgeport, Conn.

NOTICE! POND'S TOOLS.

The undersigned has assumed the Personal Property, including accounts, finished and unfinished Machinery, good will &c., connected with the manufacture of MACHINIST'S TOOLS as conducted by Mr. Lucius W. Pond since 1847, and will continue the said business at the old stand, cor. Union and Exchange Sts., Worcester, Mass., under the name of DAVID W. POND, Successor to LUCIUS W. POND.

CARD.—Having assumed the business mentioned above, I solicit inquiry and patronage, with guarantee that present standard of Workmanship, and quality of Machinery shall be maintained. A large quantity of New and Second-Hand Tools, ALL STYLES, For Sale at Low Prices. Send for list of second-hand tools. Store at 98 Liberty St., New York, will be discontinued from Feb. 1, 1876, and all sales made from manufactory.

Respectfully,

DAVID W. POND, Successor to LUCIUS W. POND.

DISSOLUTION OF COPARTNERSHIP

The firm of McClernan & Hymes is this day dissolved by mutual consent. The business of the firm will be liquidated by M. McClernan alone, No. 130 Liberty Street.

New York, Jan. 30, 1876.

M. McCLERNAN, D. HYMES.

Special Notice.

JUST ISSUED.—Seed & Agricultural Implement Catalogue.

300 Illustrations and Price List mailed on receipt of 10c.

A. B. COHU, 197 Water Street, N. Y.

Partner Wanted,

In large Iron Property. Charcoal Furnace and Forge Works leased for \$12,000 per annum, quarterly payments. Room for other works. Make best quality metal. Address

P. O. Box 563, Baltimore, Md.

To Manufacturers and Patentees.

Wanted useful patented articles for manufacture, suitable for sale by hardware dealers. Cash will be paid for patents or advance made for royalty.

Address,

P. P. PRATT, Care PRATT & CO., Buffalo, N. Y.

DISCOUNT LISTS.

Hinges & Stanley Works' 1st...10% to 20% each. 2nd and Butts, & Union Mfg Co.'s...10% to 20% each. Bolt, File and Hinge and Bolt List.—Contains all the lists and discounts that are used.....Price \$1.00

Dayton & Lamberson, 97 Chambers St., N. Y.

Worcester Free Institute.

APPRENTICE CLASS, Enter January 29. Address,

Prof. C. O. THOMPSON, Worcester, Mass.

HARDWARE SPECIALTIES

Manufactured to order on favorable terms. POWER AND ROOM to Rent by the CORRUGATED METAL CO., East Berlin, C.

For Sale.

Mortgage Sale of Charcoal Furnaces, also 1700 tons of charcoal pig metal, good car wheel, and Bessemer pig iron, according to grades (1, 2, 3, 4, 5) to be sold at auction, March 7th, 1876, 10 o'clock, a. m., on premises, at Fort Leyden, Lewis Co., New York. The property consists of 2 stacks, 9 feet high, one in complete working order; will make 10 tons each per day. Water power (about 30 horse), 15 acres in furnace lot in fee (on which are furnaces, tank and machinery houses, coal sheds, office building, large boarding house for laborers, and four other houses for families; also large mine of magnetite ore on same plot); also, 1000 acres of wood land in fee, hardwood on 20,000 acres adjoining land, 30 cents an acre royalty. Charcoal iron can be made at these furnaces now for \$25 or less a ton. Large quantities of iron made by these furnaces have been sold to and used by leading car wheel and other manufacturers with perfect satisfaction. Your attention is particularly called to the sale of both furnaces, pig iron and materials, 25,000 bushels of charcoal, tools, etc. The furnace could be put in blast in 30 days. The Utica and Black River Railroad and Black River Canal pass within a few hundred yards of the furnace. The iron will be sold in lots to suit purchasers.

T. H. WAGSTAFF, Sec'y of Black River Iron and Mining Co., 61 Broadway, N. Y., Room 53.

For Sale in Raynham, Mass., Nail Works,

consisting of nearly new buildings. The Machinery is complete, consisting in part of 20 nail machines (capable of making Tacks, 3d. Fine and other Small Nails); Boiler and Vats for pickling; Rattlers and Bluing Machinery; 50 Horse Power Water Wheel.

These Works were formerly known as the Raynham Tack Works.

are in the best condition and now running. Will be sold low for cash or on favorable terms by

LEEDS, ROBINSON & CO., 75 North Street, Boston.

HARDWARE STORE, FOR SALE.

In one of two stores situated in a city of seven thousand inhabitants, three railroads, fine country soil, unimproved. Best reasons for selling. For further information, address,

KING & SON, Lima, Allen Co., Ohio.

BLACK WALNUT For Sale Cheap.

Large quantities of pieces of plank suitable for turning and sawing into any article requiring such wood. Perfectly Dry and Sound.

PROVIDENCE TOOL CO., Providence, R. I.

FOR SALE.

Hardware, Tin and Stove business, in one of the best towns in Michigan. Can be bought on easy terms. Address,

Box 168, South Bay City, Mich.

AT FURNACE SITE,

On the 23d Mar. 1876, at 12 o'clock, Noon.

FOR SALE at Public Auction

The Napanock Blast Furnace Property. Description of the furnace is about as follows: Height of stack 45 feet high, and 12 feet high, built of stone to top of bush, thence up of brick banded with heavy iron; lining in of fire brick 20 inches thick. Hearth and boss are of fire brick. Tunnel head is 6 feet diameter. Hot blast was erected by Mr. McChes, of Reading, Pa.; is first-class, almost new. The power is of water, said to be of double the capacity; one of the best water powers in the State. Wheel is 6 ft. high, 26 feet diameter 6 1/2 feet face. Capacity of furnace 20 tons Anthracite iron or 15 tons of charcoal iron. Woodland is abundant, from \$10 to \$25 per acre, for many years. Ore by railroad or by Delaware and Hudson Canal, which passes Napanock, which is a thriving place, two miles from Ellenville, Ulster Co., New York.

For further particulars, apply at furnace or of

H. HANGE, 94 Gold Street, New York City.

FOR SALE.

TESTING MACHINE, built by the Son-A-Boston Iron Co., arranged for tensile and compressive strains, capacity 150 tons.

MILLING MACHINE, built by Brinard Milling Machine Co., cutters swing 29 inches diameter, and spindle set at right angles, which insures accurate work.

IRON ROOF, that covers New England Iron Co.'s Mill, Sarches 80 feet span, posts 18 feet high, building now 80 feet and 90 feet long.

ROLLING TABLE, for straightening iron.

FUDDLE TRAIN, for Bullets and 3, 4 and 6 inch Bars.

FIVE DRILLS.

CORRUGATING MACHINE, Complete.

CORRUGATED SHEET IRON and barbed Nails.

SMALL UPRIGHT ENGINE, 15 H. P., inch cylinder.

PUMPS, Etc.

Apply to WM. E. COFFIN & CO., 8 Oliver Street, Boston.

HARDWARE BUSINESS For Sale.

In the city of Norwich, Conn., an old stand facing two streets. Rents low. Good help and doing a prosperous business. Large back country. The best of reasons given for selling. Address,

FULLER & PARISH, Norwich, Conn.

FOR SALE.

At Lowest Manufacturers' Rates, GUNS & SHEET ZINC, Best German and Belgian Brands, By LOUIS WINDMULLER & ROEHLER, 20 Reade Street, N. Y.

FOR SALE.

An 1/4 inch mill train for making Merchant, Band and Hoop Iron. Will be sold cheap.

Apply to

W. W. JONES, Near the Lehigh Valley Railroad Depot, Allentown, Pa.

For Sale, Stove and Tin Business.

Will sell, on good terms, one of the best arranged House Furnishing Stores in Canada West, at St. Thomas. The premises are roomy, the buildings having been arranged especially for this trade, with Tinsmith's workshops and benches complete for 12 men.

Present Stock about \$6000.

St. Thomas is the head quarters of the Canadian Southern Railway Co. To a practical, energetic man this offers unusual advantages. Business well established and with good connection. Reason for disposal, present proprietors increasing their wholesale and retail hardware Store next door to the above premises. Address

HORSMAN & HORSMAN, Iron and Hardware Merchants, St. Thomas, Canada West.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, March 15, 1876.

The condition of the several financial markets was dull until Thursday, when the street was startled by the announcement of the failure of the Bank of the State of New York. The effect of the failure was only momentary, however, and will not probably lead to further disturbances in the street or in the general markets. The depositors are fully secured, but the stockholders will lose heavily. The troubles of the bank have resulted from bad management, having permitted customers to heavily overdraw their accounts. The bank was an old one, which has hitherto borne a good reputation, and its failure occasioned general surprise. As before said, the effect on the street was only temporary. Money advanced to 1 1/4 and interest, but promptly returned to 7 per cent. The ruling rates to borrowers on call have been 3 @ 3 1/2 per cent. Prime mercantile paper is quoted at 4 1/2 @ 5 1/2 per cent.

The gold market was quite steady until the flurry of excitement growing out of the events above noted caused the premium to advance to 115. The following table shows the extreme daily range of the premium:

	Highest.	Lowest.
Thursday.....	114 1/2	114 1/2
Friday.....	114 1/2	114 1/2
Saturday.....	114 1/2	114 1/2
Sunday.....	114 1/2	114 1/2
Monday.....	114 1/2	114 1/2
Tuesday.....	114 1/2	114 1/2
Wednesday.....	114 1/2	114 1/2

The bond market has been strong throughout the week, and firm at London. State bonds are firm, with the exception of Tennessee, which show a tendency to weakness, and railroad bonds are generally strong. We give below the following quotations of governments.

The stock market has been irregular, with features of momentary speculative interest. The principal dealers were in Wisconsin, Erie, Pacific Mail, Western Union and Union Pacific. We give below the closing quotations of active shares.

The bank statement shows a gain in surplus reserve of \$953,400, the surplus reserve now being \$13,993,600. The gain in deposits is only \$676,400; it should be, to make the statement balance, \$1,570,000; the difference between these two amounts shows the loss in national bank notes, which loss may be accounted for by the working of the redemption system. The following is a comparison of the bank awards for the past two weeks:

	March 4.	March 11.	Difference.
Loans.....	\$70,192,900	\$70,748,400	Inc. \$555,500
Specie.....	22,701,600	23,199,800	Inc. 498,200
Legal tenders.....	46,945,300	47,622,500	Inc. 677,200
Deposits.....	226,436,400	227,102,800	Inc. 666,400
Circulation.....	16,852,500	16,097,700	Dec. 754,800

The following table shows the foreign trade movements for the week:

	1874.	1875.	1876.
Total for week.....	\$9,909,096	\$7,233,555	\$5,408,848
Prev. reported.....	70,686,452	66,819,611	60,464,567
Since Jan. 1.....	\$70,595,548	\$74,043,766	\$65,873,385

Among the imports of general merchandise were articles valued as follows:

	Quant.	Value.
Antils.....	100	\$1,135
Brass goods.....	18	4,561
Bronzes.....	16	3,196
Chains and anchors.....	141	5,983
Cutlery.....	41	4,280
Gas fixtures.....	1	1,017
Guns.....	30	5,730
Hardware.....	14	1,603
Iron, pig, tons.....	546	11,245
Iron ore, tons.....	461	11,245
Metal goods.....	101	11,247
Needles.....	13	8,575
Old metal.....	10	2,043
Per. caps.....	924	15,049
Shed.....	5	765
Silverware.....	20,877	134,214
Tin, boxes.....	6,896	4,971
Tin, 3/8 lbs.....	806	8,014

EXPORTS, EXCLUSIVE OF SPECIE.

	1874.	1875.	1876.
Total for week.....	\$4,781,488	\$5,127,006	\$3,838,594
Prev. reported.....	32,750,510	44,608,536	47,755,759
Since Jan. 1.....	\$37,531,998	\$49,735,542	\$51,594,353

EXPORTS OF SPECIE.

	1874.	1875.	1876.
Total for week.....	\$304,438	\$304,438	\$304,438
Previously reported.....	102,890	102,890	102,890
Total since Jan. 1, 1876.....	\$887,373	\$887,373	\$887,373
Same time in 1875.....	1,096,463	1,096,463	1,096,463
Same time in 1874.....	407,689	407,689	407,689
Same time in 1873.....	291,975	291,975	291,975

Government bonds at the close were quoted as follows:

	Bid.	Asked.
U. S. Currency 68.....	125 1/2	127
U. S. 6s 1881, reg.....	122 1/2	123 1/2
U. S. 6s 1881, con.....	122 1/2	123 1/2
U. S. 5-30 1883, reg.....	118 1/2	119 1/2
U. S. 5-30 1883, con.....	118 1/2	119 1/2
U. S. 5-30 1883, new reg.....	119 1/2	120 1/2
U. S. 5-30 1883, con.....	119 1/2	120 1/2
U. S. 5-30 1887, reg.....	121 1/2	122 1/2
U. S. 5-30 1887, con.....	121 1/2	122 1/2
U. S. 5-30 1888, reg.....	122 1/2	123 1/2
U. S. 5-30 1888, con.....	122 1/2	123 1/2
U. S. 10-40 reg.....	118 1/2	119 1/2
U. S. 10-40 con.....	118 1/2	119 1/2
U. S. 6s 1881, reg.....	118 1/2	119 1/2
U. S. 6s 1881, con.....	118 1/2	119 1/2

The following are the quotations of active stocks at the close of business to-day:

	Bid.	Asked.
Atlantic & Pacific R. R. Preferred.....	4 1/2	4 3/4
Atlantic & Pacific Telegraph.....	19	19 1/2
Chicago & Northwestern.....	43 1/2	44 1/2
Del. Lack. & Western.....	64 1/2	65 1/2
Chicago, Rock Island and Pacific.....	110 1/2	111 1/2
Chic. Bar. & Quincy.....	118	119
Col. Chic. & Ind. Cent.....	4 1/2	4 3/4
Clev. Col. & Ind. Cent.....	50 1/2	51 1/2
Cleveland and Pittsburgh.....	104	105
Chicago & Alton.....	110 1/2	111 1/2
Consolidation Coal.....	41 1/2	42 1/2
Canton.....	19 1/2	20 1/2
Del. Lack. & Western.....	118 1/2	119 1/2
Delaware & Hudson Canal.....	119 1/2	120 1/2
Adams Express.....	106 1/2	107 1/2
American Express.....	63 1/2	64 1/2
United States Express.....	73 1/2	74 1/2
Wells, Fargo & Co. Express.....	86 1/2	87 1/2
Erie.....	30 1/2	31 1/2
Hanibal & St. Joseph.....	18 1/2	19 1/2
Illinois Central.....	103 1/2	104 1/2
Kansas Pacific.....	12 1/2	13 1/2
Kansas & Texas.....	13 1/2	14 1/2
Lake Shore.....	64 1/2	65 1/2
Michigan Central.....	65 1/2	66 1/2
Morris & Essex.....	100 1/2	101 1/2

Milwaukee & St. Paul.....	44 1/2	45 1/2
Mariposa.....	9 1/2	10 1/2
New York Central.....	118 1/2	119 1/2
New Jersey Central.....	106 1/2	107 1/2
New Jersey South.....	1 1/2	1 3/4
Ohio & Mississippi.....	21 1/2	22 1/2
Pacific Mail.....	23 1/2	24 1/2
Panama.....	133 1/2	134 1/2
Pittsburgh & Fort Wayne.....	103 1/2	104 1/2
Pacific of Missouri.....	137 1/2	138 1/2
Quicksilver.....	173 1/2	174 1/2
St. L. & Kan. City Northern.....	29 1/2	30 1/2
St. L. & Kan. City Southern.....	29 1/2	30 1/2
Tol. Wabash & Western.....	3 1/2	3 3/4
Union Pacific.....	65 1/2	66 1/2
Western Union Telegraph.....	67 1/2	68 1/2
Ex dividend.....		

GENERAL HARDWARE.

We cannot report much improvement in business during the week under review; a great many mail orders have been received by our city houses, but they are, with very few exceptions, of the small "hand-to-mouth" description, with which the trade has become so familiar during the past two or three years. There are very few changes in values to report.

In Foreign Hardware we hear of a better inquiry, and from some sections fair orders have been received. Alfred Field & Co. have issued the following circular to the trade:

SHEEP SHEARS.
NEW YORK, March 10, 1876.
DEAR SIR: We beg to inform you that we now have in stock Sheep Shears of precisely same pattern as Wilkinson's, and of equally good quality and finish, made by Mr. Isaac Greaves, whose reputation for reliable and excellent goods is not inferior to any manufacturer in Sheffield.

These Shears are numbered same as Wilkinson's, and can therefore be ordered by Wilkinson's numbers.

We offer you Shears, precisely like Wilkinson's, and quality and finish fully up to his standard, at a very much lower price.

We strongly recommend you to try these Shears, as they will give good satisfaction.

We also solicit orders for Greaves' Hedge Shears, both for importation and from stock.

Your friends truly,
ALFRED FIELD & CO.
Agents for Isaac Greaves.

The demand for Nails shows some improvement over the previous week, and the market is very steady at our quotations. We quote as before: 104, \$2.85, net. From this figure a concession could be obtained, for lots, of from 5 to 10 cents per keg, according to quantity and brand.

The Lalance & Grosjean Manufacturing Co. are hard at work rebuilding their recently destroyed factory. Already more than one story of the new building is completed, and with their very large force of men they expect to be in running order in about sixty days. In the meantime they are making many of their specialties in temporary buildings, and with the large stock of goods which they had on hand in their warehouse at the time of the fire, they are filling orders for nearly everything in their line, as usual.

Notwithstanding the rumors which have been current during the week that the Russell & Erwin Mfg. Co. were not selling Screws at the price quoted in their circular, and published by us last week, we are informed that they are producing a fair assortment of Screws, and are filling orders at the price quoted, viz., discount 50 per cent.

J. Clark Wilson & Co. make the following correction in their discount sheet which we published last week: Mallets, on page 43 of their catalogue of 1874, should be discount 10 per cent. instead of 20 per cent., as printed.

Fernald & Sise have in press, and will issue in a few days, a supplement to their catalogue of 1874, giving lists for the specialties which they have added to their assortment since their book was printed. The supplement will contain the following lists: Brown, Human & Co.'s Agricultural Tools; Humphreysville Mfg. Co.'s Augers and Bits; Thurston Knob Screw Co.'s Hat Pins, Door Stops, &c.; Wallensack's Transom Lifters; Wright & Co.'s Metallic Slaves; Novelty Door Hangers and Rollers; American Ice Chisels; Haines and Excelsior Silver Glass Knobs, &c.

Peace & Hogan, proprietors of the Vulcan Saw Works, Williamsburgh, N. Y., have opened an office and warehouse at No. 50 Beekman street, where they will, for the convenience of the city trade, keep in stock a full assortment of their goods.

The manufacturers of Cordage have issued the following revised list under date of the 8th instant, showing a reduction in price of Sisal Rope of 1/2 c. per pound. The usual trade discount remains as before:

	March 8th, 1876.
Manila Cordage, sizes above 12 th'd.....	14 1/2 cts.
5-16 in. diameter, 12 th'd (3/4 in. diam.).....	15 1/2
Manila Cordage, 12 th'd (3/4 in. diam.).....	15 1/2
" Hay Rope.....	14 1/2
" Cordage, bolt rope yarns.....	16 1/2
" 12 th'd.....	16 1/2
Manila White Lines.....	17 1/2
Tar'd Manila.....	14 1/2
Fine Tar'd Manila Lath Yarn.....	15 1/2
Sisal Rope, sizes above 12 th'd & Hay Rope.....	9 1/2
" 6 th'd and 9 th'd.....	10 1/2
" 12 th'd.....	10 1/2
New Zealand Cordage, sizes above 12 th'd.....	12 1/2
New Zealand Cordage, 6 th'd and 9 th'd (3/4 in. diam.).....	12 1/2
New Zealand Cordage, 12 th'd (3/4 in. diam.).....	12 1/2
New Zealand Lath Yarn (Tar'd).....	11 1/2
Russia Hemp Tar'd Cordage.....	14 1/2
American Hacked Hemp Tar'd Cordage.....	13 1/2

Edward K. Tryon, Jr., & Co., Philadelphia, have placed on the market their "Improved New Model Derringer Cartridge Revolvers," made after the Smith & Wesson model, with hinged barrel. These goods are made in two sizes: No. 1, 22 caliber, seven chambers, and No. 2, 32 caliber, long cartridge, five chambers. The following is their price list:

IMPROVED NEW MODEL DERRINGER CARTRIDGE REVOLVERS.
Quality of Material and Workmanship First Class.
Warranted.

	Price List.
No. 1. Improved New Model, 22 Caliber, half Nickel Plated.....	\$5.75
No. 2. Improved New Model, 32 long Caliber, half Nickel Plated.....	6.00
Extra for full Nickel Plating.....	50

	No. 1.	No. 2.
Extra for full Nickel Plating, with Gold Plated Cylinder and Base Pin.....	\$1.50	\$2.00
Extra for full Gold Plating.....	2.00	3.25
Extra for Engraving, best quality.....	1.00	1.25
No. 1, \$1.50; No. 2, \$1.75. 2d qual. 1.00 1.25		
Extra for Ivory Stock.....	1.50	1.50
Extra for Ivory Stock, Carved Head.....	3.50	3.50
Extra for Pearl Stock.....	3.50	3.50

A liberal discount from above prices when ordered in quantities of 50.
Please order samples of us.
Edw. K. Tryon, Jr., & Co., Sole Agents,
No. 19 North Sixth street, and No. 220 North Second street, Philadelphia.
The Derringer No. 2 will be ready for sale about March 15th. Meanwhile all orders received will be filled from first lots finished.

A. & E. H. Sedgwick, J. Clark Wilson & Co., agents, have issued the following discount sheet, to be applied to their illustrated catalogue and price list of 1873. They have added to their assortment of Garden Tools the following:

	Boys' Sets Garden Tools.
No. 82.—Three pieces, Spade, Fork and Hoe and Rake, Steel Spade and Mal. Fork and Rake, lighter than No. 84.....	per doz. sets, \$18.00
Improved Socket Shovel Hoe.....	No. 93.
Inch.....	6 7 8 10
Per doz.....	\$7.50 8.00 8.50 9.50

DISCOUNT SHEET TO ILLUSTRATED CATALOGUE AND PRICE LIST, 1873.
March, 1876.

	Discount per cent.
Cheese Tryers.....	25
No. 4. Extra Forged Solid, Tempered.....	30
Butter Tryers.....	25
No. 7. Extra Forged Solid, Tempered.....	30
Flour Tryers.....	25
"Elbow" Door Springs.....	25
Comb Strainers.....	25
Spoke and Cooper Shaves.....	25
"Horse-Shoe" Saw Sets.....	25
Pruning and Sheep Toe Shears.....	25
Pruning Saw with Chisel.....	25
Pruning Saw with Hook.....	25
Edging and Border Knives.....	25
Garden Trowels.....	25
Feeding Forks.....	25
Garden Rakes.....	25
Boys' Sets Garden Tools.....	25
Shuffle Hoes.....	25
Socket Shovel Hoes.....	25
Improved.....	25
Floor Scrapers.....	25
Garden Hoes and Rakes.....	25
Comb Plates, Card Cleaners, &c.....	25
Hercules Printing Press.....	25
Patent Clay Grinding Mill and Screen.....	25
Boys' Sleds.....	25
Above Discounts subject to change without notification.	

The Chadborn & Coldwell Manufacturing Company have issued the following circular and price list for the "Excelsior Lawn Mower" for the season of 1876. Sargent & Co. quote these goods at discount 22 1/2 and 10 per cent., cash.

	Excelsior Hand Lawn Mower.
No. 1, 9-Inch Cut.....	\$14.00
No. 2, 12-Inch Cut.....	14.00
No. 3, 15-Inch Cut.....	22.00
No. 4, 18-Inch Cut.....	26.00

ITS ADVANTAGES OVER OTHER MOWERS.

It runs lighter; it cuts the borders; it cuts higher grass; the gears are perfectly covered; it rolls the ground; it needs less repairs; its adjustments are more simple; the roller does not run in the standing grass.
In pre-empting to the public our Excelsior Lawn Mowers for 1876, we think it unnecessary to enter into a discussion of its merits, believing that the numerous trials to which our Mower has been subjected, in this country and in Europe, and the numerous testimonials and premiums that have been invariably awarded us over competing Lawn Mowers, warrant us in asserting that our Excelsior Lawn Mowers, for both hand and horse-power, are greatly superior to any now in use. We refer with pride to the fact that our Lawn Mowers can be seen in constant operation, during the season, on Central Park, New York; Boston Common; Government Grounds, Washington, and on nearly all the prominent parks and public grounds in the United States and Canada.

We are the largest manufacturers of Lawn Mowers in the world, making eight sizes as heretofore, and we fully guarantee entire satisfaction to all who shall favor us with their orders. Thankful for past patronage, we respectfully solicit its continuance for the future.

CHADBORN & COLDWELL MFG. CO.

	Price List.
No. 5, 25-Inch Cut.....	\$ 75
No. 6, 30 ".....	125
No. 7, 35 ".....	160
No. 8, 40 ".....	200

The unusually flattering success which has attended the introduction of our new Horse Lawn Mower has greatly exceeded our expectations. We believed the New Mower an excellent one, and confidently hoped well for it, but we were not prepared for the hearty commendation we received from those who gave the New Mower a trial. In the construction of our New Horse Lawn Mowers only the very best material is used, and the design is such as to combine the greatest possible strength with lightness of draught and perfect working qualities. The gears are perfectly covered, becoming clogged with grass or dirt is simply impossible. We manufacture four sizes of this New Horse Mower, enabling us to supply the wants of those having small lawns, as well as those having more extensive ones. We confidently make the claim of manufacturing the most perfect Horse Lawn Mower in use, and we place it before the public on its own merits, asking a trial from those who would have a perfect Horse Lawn Mower. Each Mower warranted in every particular.

Hotchkiss' Sons, Bridgeport, Conn., invite the attention of the trade to their patent claims, which are fully expounded in their advertisement on the 25th page.

We invite attention to the advertisement of the Derby Silver Company, of Derby, Conn., on the 40th page, manufacturers of Silver Plated Spoons and Forks, and German Silver Flat Ware. E. N. Shelton is president of the Company, and E. L. Britton, general agent.

Attention is also invited to the advertisement, on page 4, of Whitehead Brothers, No. 517 West Fifteenth street, New York, established in 1836. They are extensive dealers in all grades of New Jersey, North River, Crescent and Albany Molding Sands, Fire Clay and Sand, Kaolin and Foundry Facings. The location of their business is such as to ensure prompt and cheap dispatch of orders.

The following circular explains itself:

OFFICE OF RIVERSIDE IRON WORKS.
WEEKLING, W. V. A., March 1, 1876.
DEAR SIR: Having secured the services of Mr. T. S. Casey for the last three years with the Wheeling Hinge Co. as salesman of Riverside Nails, we hope that you will still continue the confidence you have reposed in him during the past.

Mr. Casey will soon have the pleasure of meeting you personally, and any favors you may kindly intrust to him will receive our prompt attention.
Very respectfully,
RIVERSIDE IRON WORKS.

BRITISH IRON MARKET.

(Specially reported by cable for The Iron Age.)
WEDNESDAY, March 15, 1876.

Scotch Pig.—The market is quiet, with a moderate business doing. Prices are weak. The following are makers' quotations:

Gartsherrie No. 1.....	69 1/2
Coltness No. 1.....	52 1/2
Glenarnock No. 1.....	67 1/2
Eglinton No. 1.....	59 1/2

Manufactured Iron.—There is no demand, and prices are nominal.

Rails.—The market remains without noticeable change.

IRON.

American Pig.—There has been no improvement in any respect during the week. The demand has been even more limited, and prices are nominally unchanged, but really weaker. The only sale we hear of is 300 tons Poughkeepsie, on private terms. We continue to quote No. 1 Foundry, \$23; No. 2 Foundry, \$21; Gray Forge, \$20.

Scotch Pig.—The market continues without change, prices being maintained. The small importations are taken up as fast as they arrive, but little, if any, going into store. We note the sale of 75 tons Eglinton and 100 tons Coltness, on private terms. We quote Coltness, \$32 @ \$33; Glenarnock, \$30 @ \$31; Gartsherrie, \$32-50; Eglinton, \$29

title at the works are: No. 1, 78/ to 80/; No. 2, 76/ to 77/; No. 3, 74/ to 75/; Millom ordinary, No. 3, 72/; No. 4, 71/6; No. 5, 71/; mottled, 78/ to 80/; and white, 79/ to 80/ per ton, with 2 1/2 off for net cash. Maryport quotations are steady. A good Derbyshire No. 3 is quoted at 63/ to 65/ at works.

The rail trade is still in a quiet state, very few of the mills having any orders of bulk in hand. A hear of an order for 3000 tons of steel rails having been placed with a local concern by a leading home railway company at a price per ton which will hardly leave outside £8 when all expenses have been deducted. The Manchester, Sheffield and Lincolnshire Rail road Company, which formerly bought large parcels of steel rails here, is now out of the field, the company having commenced rolling and re-rolling for their own requirements at new works which have been erected at Gorton, near Manchester. Some of the Lancashire firms are formidable competitors with Sheffield houses for North and Northwestern orders, and also for those emanating from the Irish railways, as they are nearer the shipping port, and consequently save a good deal in the way of carriage expenses.

A few orders of limited size are in course of execution for patent, conical and other buffers, as also for railway carriage, wagon and engine springs. Most of these, except the latter, are for the railway carriage and wagon builders. Bessemer steel itself is in some little request, partly for tires and partly for use in forgings or for minor purposes. The cutlery manufacturers are becoming more and more in the habit of using this material in place of the much more expensive cast steel, the difference in price being, in many instances, fully 40 to 50 per cent. in favor of Bessemer. Siemens steel is also being produced in moderate quantities at two of the local works, for use in spring making, and for sundry specified purposes, instead of crucible steel.

The annual report of the directors of the Midland Iron Company, Limited, which has been looked for with a good deal of interest, was issued to the shareholders on Saturday last. The company, it may be remarked, a couple of years ago paid over 60 per cent. dividend, and last year a large dividend was also made. The present report states that the net profit for the year is £3337, 9/8, out of which, with a balance brought forward from last year, a dividend is proposed of 8 per cent. On August 27th last, continues the report, a circular was issued to the shareholders informing them that the repairs to machinery caused by the accident in the early part of the year, by stopping the works several weeks, had absorbed a large proportion of the profits made. The plant and machinery are now in good condition. The present hoop mill being insufficient to satisfy the increasing demand for hoops, the company's manufacture, an additional mill of the kind is being erected at an estimated cost of between £5000 and £6000.

On Monday the question as to the secretaryship of the South Yorkshire Miners' Association, which has for some weeks been a cause of much agitation and ferment in the district, was finally settled at a largely attended meeting of delegates held at Batley. There were eight candidates, among them being Mr. Philip Casey, who was at one time joint secretary with the late John Normansell, and who would doubtless have been again elected had he not damaged his chances by ill-timed and somewhat plausible explanations as to the accounts of the association. Mr. J. Frith, Parkgate, was elected secretary, Mr. Casey being fourth in point of the votes given to him.

The report of the directors of the Rotherham, Maseborough and Holmes Colliery Company, Limited, a concern which paid 80 per cent. 12 months back, is now forthcoming, and furnishes additional evidence, if such were needed, of the depressed state of trade. The directors state that the depression in the iron trade has had its effects on the price of coal. The profits for the past year have been £5246. After paying interest on the preference capital, the balance has been placed toward the reduction of expenditure on capital account. The expenditure on the new coke ovens, &c., has been £11,559; the new shaft was suspended at the High Hazle seam, which is being worked satisfactorily, as also is the slack washing apparatus.

The trade generally is very quiet, and there is beginning to be considerable underselling in all departments of it. For instance, although steam coal to the railway companies is nominally quoted 10/6, yet at least one local colliery concern is supplying one of the largest companies at about 7/6 per ton. The likeston and Rutland collieries, Derbyshire, are lowering wages, as also is the Stanton Iron Company.

There is very little change in cutlery of any kind. One of the Sheffield papers this morning states that a strike is likely to result from the demand of the self-ore forgers for an advance of 30 per cent. Some of the firms have large stocks on hand, and others are said to be importing German goods in an unfinished condition. One of the "little masters" says that if the men would work nine hours a day at the present rate—1/2 per dozen for 4 1/2 inch weavers' scissors—they could each earn 9/4 per diem—not by any means bad pay.

STAFFORDSHIRE AND BIRMINGHAM.

Orders of all kinds are scarce in Staffordshire. Few of the mills and forges are running more than three days weekly, and many are wholly stopped. Prices remain stationary. Common bars, £7, 15/ to £8, and best bars, £9, 10/ to £10. Manufactured iron of the various kinds for fencing and miscellaneous purposes is selling well in small lots. The hardware industries are not active, but in few of them there are any real dullness to be reported. Nails, nuts, bolts, screws, safes, locks, buttons, nails, galvanized sheets, bedsteads and gas fittings are, perhaps, selling more steadily and in the largest quantities.

SOUTH WALES.

This week affords little news. The Brynmawr and Nantyglo Company has given notice of the termination of all contracts at the end of March. A good consignment of tin was sent last week from Swansea to Lisbon. At Sydney, Thomas & Company turned out 1300 boxes of tin plates last week, at the average price of 23/ per box, as compared with 47/ to 50/ the week previous. Downfalls is said to have a stock of at least 20,000 tons of puddled bars in hand. Welsh steel rails are quoted under £8, 10/ per ton for light sections.

THE METAL MARKETS.

On Monday all the metals opened quietly, and no business of note was transacted. On Tuesday Chill bars were sold at £79, cash, as small parcels of Wallaroo at £88. Tin at £77 for Straits, spot. Spelter and Lead both dull and easier. On Wednesday Tin was easier, 30 tons Straits done at £76 to £76, 10/. On Thursday Copper was weaker, Chill bars (100 tons) being done at £78 to £78, 10/. Tin was dull and lower; Australian at £75, 10/ spot. On Friday Chill bars sold at £78, and a little Wallaroo at £87, 10/ cash. Tin, again lower, 50 tons Straits done at £75 to £75, 10/ spot and forward. Australian, £75, spot; Chill bars, g. o. b., at £78; Wallaroo, £89, 10/.

—Messrs. Von Dadelzen & North report: Copper continues dull and lower prices accepted. G. o. b. Chill bars have been sold at £78, 10/, and even at £78. In Australian small parcels of Wallaroo have been sold at £88, which is the nominal price of Burma. It is announced to-day that in future all the Wal-

laroo received by the agents of the company here will be sold by public sale every three months. The first will be held on 28th March, and consist of about 2000 tons. English flat; tough, £85 to £86; strong sheets, £91 to £92; India sheets, £90. Tin has again declined. Sales of Straits have been made at from £77, 10/ to £76, on the spot, and £77 to £75, 10/ for forward delivery. Australian is also lower, there being sellers at £75, 10/. Banca remains nominally 50 1/2 fl.; Billiton, 47 1/2 fl. English ingots, £80; bars, £81. Tin plates difficult of sale, even at the low prices ruling. Large parcels of cokes are reported to have been forced off at 20/ in Liverpool. Lead dull; English, £22 to £22, 5/; soft Spanish, £21, 5/ to £21, 10/. Spelter unchanged—£25 to £25, 5/ delivered here. Quicksilver reduced to £10, at which a fair business has been done.

The Mining Journal remarks: Copper.—The market has continued to drag throughout the week, and prices still have a downward tendency. Chill bars, which closed at £79, 10/, were quoted in the early part of this week at £79 for g. o. b. Business was reported in Chill bars on Thursday and to-day at £78, g. o. b., usual cash. The demand for English is very limited. Tough is quoted at £85; select, £86; 4 by 4 sheets, £89; strong sheets, £91 to £92; and yellow metal, 7 1/2 d. Until prices are still further reduced it is not easy to see where any improvement in business is to be looked for. The support which the Indian market has afforded has been almost entirely withdrawn, owing to the unfavorable rate of exchange. This, however, is slightly improved, but not to such an extent as to encourage buyers to give out their orders. A public sale of 3000 tons of Wallaroo is announced for March 28, at the Baltic Sales rooms, and it is intended in future to have quarterly sales of this description of copper. Should this mode of selling foreign copper prove a success, there is little doubt but that it will very soon be generally adopted by other sellers; at present, however, it is, of course, questionable whether public sales will prove more advantageous than private ones. Tin.—Throughout the week the market has been falling, and Straits is £3 lower since our last; quotations to-day for Straits bring £75 English has also participated in the decline, and ingots are now obtainable at £79, 10/. It is expected that the stock of tin at the end of the month will show a considerable increase still further against the market. Lead.—The market has been dull, and quotations have been a shade lower than last week. Good soft English pig is quoted £21, 15/ to £22; and soft Spanish, without silver, £21, 10/. Spelter.—The demand is limited; £25 to £25, 5/ is quoted for ordinary Silesian. Quicksilver.—Very little was done in this metal while the quotation stood at £10, 10/; but on Wednesday the price was reduced to £10, at which the metal was bought. Latest Liverpool prices are these:

Iron: f. o. b. in Liverpool, per ton.

	£	s.	d.
Merchant bar	7	10	0
Merchant bar, in Wales	7	0	0
Staffordshire	5	0	0
Hoop	9	10	0
Sheet	11	5	0
Nail rod	8	5	0
Bar, best crown	5	0	0
Boiler plates	10	10	0

Tin Plates: f. o. b. in Liverpool, per box.

	£	s.	d.
Charcoal, I. C.	1	5	6
Coke, I. C.	1	2	0

Copper: Delivered in Liverpool, per ton.

	£	s.	d.
Bolt and Sheathing	97	0	0
Tin	90	0	0
Tough cake	90	0	0
Best selected	92	0	0

Labor Troubles in England.

A writer in the London Times says: Great anxiety exists with respect to the threatened rupture between the employers and workmen in the iron trades. Always, in cases of this kind, broad issues only are placed before the public; and so, rightly or wrongly, the general public are led to understand that this is a systematic rebellion of the whole body of the workmen in the iron trades of the country against the principles and practice of piece-work. On that issue I do not hesitate to say that public feeling is wholly against the workmen, and I fear that if this struggle goes on and extends itself throughout the trade, and the masters enforce their protest by a general lock-out, the men will be in a worse position as to public sympathy than have been the workmen or laborers in any former strike. In a matter that so deeply concerns the public, it is an unfortunate thing that there are not means of making the public understand the details and complications which prevent a question like this from being decided off-hand on some simple, general principle. If the trades unions make war on piece-work as a principle, on the ground that there should be equality of earnings, they will unquestionably find the country so determinedly hostile that anything like a victory will be impossible; but, on the other hand, those who gain all their knowledge on such subjects as this from the newspapers, ought to be made to understand that while day work is a very simple thing, easily managed, and kept within definite rules as to wages, regular employment, &c., piece-work is a complex system which is as yet, to a very large extent, carried on in a crude fashion, and liable to a great deal of abuse, from which the men are the principal sufferers, and it would be well if the masters, while declaring for piece-work—as they are perhaps entitled to declare, backed up as they are by public opinion, and by the political economists—would endeavor to establish, with the concurrence of the men, such a set of regulations with regard to piece-work as would render the system less liable to hardship and abuse. Inquiring into this subject the other day, I found myself in conversation with a workman employed in a large manufactory of cheap shoes. I told him that I was surprised to see him at that work, as I had known him some years ago as a "crack" workman, employed by west end shops in the making of expensive shoes, at a high rate of pay. He explained his reasons for taking work at the factory somewhat to the following effect: While at work for a west end shop he would wait upon his employer on Monday morning for a job, and would find that the "cutter" had not begun work, and the job was not ready. He would take a walk, and go in again in an hour or two, and find the job not quite ready. Toward the latter end of the day, perhaps, he would receive one boot, and when it was finished the other would not be quite ready for him. To get work to do on a

Monday was next to an impossibility, and though the pay for making a pair of aristocratic boots was good, there was so much leakage of time that at the end of the month the man's earnings would be hardly equal to those to be got at the factory, and there would be a balance against him for the beer with which he wiled away his time waiting for jobs. A corresponding state of things seems to exist to a large extent in connection with piece-work in the iron and other trades. And, moreover, prices for piece-work are less easily regulated and fixed in the interest of the workman than wages for time. All this must be looked into, and the evils must be redressed before we rush to the conclusion that the men are wholly in the wrong in their protest against piece-work. The foreman of some large iron works in the eastern counties told me the other day that when the nine hours' movement was established there was a general rise in the price of the manufactured article, and that rise was cleverly made to extend to such things as steam engines, which are made almost entirely on piece-work, the result being that the nine hours system put some thousands a year into the pockets of many large employers of labor in some of the iron trades. Since then I have ascertained that this rise in the selling price of manufactured articles was carried out in most branches of manufacture, and that as a general rule the result was very profitable to employers. Evidently there is a good deal to be said on both sides of this dispute between masters and men; but so far as I can see at present there is likely to be raised up a strong prejudice against the cause for which the men are fighting.

Practical Suggestions to the Retail Stove Trade.

Messrs. Southard, Robertson & Co., of this city, have favored us with a copy of their circular letter to the stove dealers with whom they are in correspondence. We present the following abstract, which will be found to contain many suggestions of interest and value:

Our trade is a necessity; none buy our goods for ornament. In the best of times stoves were the last things purchased for the household, and prices were as much objected to then as now. A silk dress at \$8 a yard was very cheap to the lady buyer, but a stove in the next store for \$15 was an outrageous swindle. They could pay for the silk dress, but if the stove man would wait for a few weeks, they would take the stove and pay him at the expiration of that time, "as times were so hard." Hard times is the prevailing cry when they buy stoves. It is a rarity to hear a person say "never mind the expense" in a stove store. You cannot retail any more stoves on an average at \$5 than at \$10, supposing a locality to have the ordinary amount of stoves in use, in a fair condition. The buyers will always be the same at either price, composed of those who absolutely need a new stove, and a few who might buy because a stove was cheap; but, as a rule, when the stove is needed, they buy it whether it is \$10 or \$20. If the people have plenty of money, and are all at work, they don't buy stoves for fun. They hang out their surplus on their backs, and aggravate the neighbors generally with their extravagance. Don't put your prices down, anticipating a rush, because they are cheap. As the seasons roll around people need stoves, and they will buy and pay the price for them. They don't buy linen dusters in January and parlor stoves in July.

Buy and sell for cash is what we would all like to do. Some say it is impossible; but it is not so to as great an extent as many imagine. We all give too much credit, and our troubles arise largely from this cause. Credit is like fire—very good while under control, but death to all when it is the master. Our present panic is due entirely to the abuse of credit. How many could pay all their debts and have enough to buy for cash, is easily shown by the amount of bills outstanding on their books. The facility with which credit has been given by the manufacturer has been a great evil. To extend trade and help a man along, it has been given too freely. The honest dealer took it, expecting that his customers would pay him in time, and finds himself eventually ruined by their non-payment, and his own small capital gone. Those who never intended to pay took all they could get, by misrepresentations. Those with large capital took it and branched out until all were involved—none could pay; one must wait for the other.

Credits must be reduced. The man who says he buys for cash is better off than the one who says he can get all the credit he wants. You can't swamp the cash man, he owes no one. The credit man may be ruined in one night. The Chicago fire showed us the vanity of our "certainties." If credit were only used as it should be, all would be well; but if you get it freely, you give to others with the same spirit. All do not look at the advantages of the percentage off for cash. 8-me put money in the savings bank, others invest in real estate, for making an extra interest. You can make more with your money in your business than in any other way.

When your business cannot use your money, outside investments would be in order—not until then. Ninety in every one hundred fail who start business. How many would have failed had they kept the money in their legitimate occupation? If you buy goods and get 6 per cent. off, cash down, it is equal to 24 per cent. interest per annum, supposing your credit average three months; if 5 per cent. in 60 days it is 30 per cent. per annum, and if you get 5 per cent. on 30 days credit, it would be 60 per cent. per annum, and so on in proportion. The best real estate investments do not pay that interest—banks only 6 per cent. When you invest your money out of your business it cannot

always be had when wanted. Outside investments are well enough after your business is clear. If you are posted in your trade, you can always make more than simple interest on your money. Job lots are continually offering, in fact numerous chances occur, when you have the money, to benefit your business; but attend to that first. Houses and lots are very well to have, but they are a source of constant care, and although the landlord may overcharge you for rent, he has all the responsibility. Bonds and mortgages must be paid, and interest also. They are debts. Don't trust so much. Your business for cash may be less than your neighbor's on time, but success is certain for you in the end. People that need stoves will pay for them, if you insist. If you pay cash for goods, you will be careful how you trust, and never need sell at a loss to raise money to pay bills. This makes an item. Ten per cent. loss on goods, and 7 per cent. interest added on unpaid account, is 17 per cent. out of pocket, leaving the cash buyer virtually 42 per cent. better off than the time man. Cash is the slowest, but the surest. The contentment ensuing from the cash basis is a handsome profit. When you are clear of debt you can appreciate how many sleepless nights are involved in the debt business. Collect your money sharp up, even if you don't need it for immediate use, and look out for the small bills. Many a man could buy \$100 worth of goods, paying cash, if he had it, and save \$6; but he says: "I have got it standing out in small bills, and don't like to ask for it." Five dollars out of twenty places makes the \$100 and earns \$6, and could be obtained by asking. Don't get angry when you are called upon for money. The very hurrying you get may save you some. You hurry up some one else that might run off, but by pushing them you get it; beside, you owe the money, and as you do not like to treat yourself from your debtors, neither should you give it.

It is all well enough to call upon the President and Congress to help us, but we can help ourselves, and now is the time to do it.

Times will and are changing for the better, while moderate quantities of everything have been produced. Consumption has gone on faster than the production.

The cautious will take warning and in prove the future. If you can't buy for cash down, strive to reach it as soon as possible. You can buy smaller lots and often. Beware of trusting. You can't be too cautious. The best judges of credit get deceived, and there is no safety like the money for your goods. We are aware all know these facts more or less, but it needs constant warnings to keep it before us. The temptation to do business on credit is great. Everything looks so well, but it is dangerous. Horace Greely said the way to resume specie payments was to resume. The way to pay cash is to pay cash. We are as able and willing to grant credit to our customers as ever, but we feel that we are doing them an injustice to make it as much as formerly.

Electrical Illumination of Factories.

In spite of the recent improvements in magneto-electric machines, especially that of Gramme, electrical illumination in factories has not displaced that by oil or gas to any extent. The Gramme machine has, however, been introduced, with satisfactory results, into an establishment in Mulhausen. The room illuminated is 136 feet by 98 feet. Four lamps, on Serris' plan, properly distributed, are employed, each run by a separate magneto-electric machine requiring about two-thirds horsepower to work it. The carbon points need changing every three hours. The cost for the four lamps per hour is about 20 cents. During two months of use no diminution of intensity has been noticed, and the illumination afforded has been steady and superior in brilliancy to that from any other source. The magneto-electric machines cost about \$300 apiece, or the four arranged, complete, about \$1600. Laboulaye gives the following table of the comparative cost of this and other methods of illumination:

Source of Light.	Consumption per hour for 1 stearin candle light.	Cost per hour for a 700 stearin candle light.
Electricity, by magneto-electric machine	0.10 to 0.20 frs.	
Electricity, by galvanic battery	3.00 to 5.00 frs.	
Coal gas	1.50 litres	3.20 frs.
Light petroleum	4.52 grams	3.85 frs.
Rape seed oil	5.18 grams	6.10 frs.
Tallow candles	10.55 grams	12.60 frs.
Stearin candles	10.40 grams	26.80 frs.
Wax candles	8.26 grams	32.10 frs.

Efforts to distribute the current from a single machine to several lamps have not proved practically successful, by reason of the great increase in the cost of the illumination, so that Gramme has been led to construct small machines, 50 candle power. While these operate very well, the light, however, is not perfectly steady, and the machines found best adapted to practical purposes are those that yield a 100 candle light.

Ocean Cables.

Many of our readers whose pursuits in life do not bring before them familiarly the great and multiplying achievements in the different departments of civil engineering that are taking place in all parts of the world, will be surprised to learn, from the following table, how many ocean cables over 500 miles in length have thus far been successfully laid. The data are taken from the Journal of Telegraph:

Year built.	From	Length of miles.
1866.	Ireland to Newfoundland	1,866
1867.	Malta to Alexandria, Egypt	925
1869.	Brest to Duxbury, Mass., via St. Pierre, Bushire, Persia, to Jask, Beloochistan	3,333
	St. Pierre to Duxbury	503
1870.	Suez to Aden, Arabia	1,469
	Aden to Bombay, India	1,818
	Porto Rico, England, to Lisbon	823
	Gibraltar to Malta	1,129
	Madras to Penang	1,048
	Singapore to Batavia	557
	Malta to Alexandria, Egypt	501

Rathbone, Cuba, to Santiago, Cuba	529
Java to Australia	1,042
1871. Singapore to Cochin China	680
Saigon to Hong Kong	975
Hong Kong to Shanghai	1,100
Shanghai to Japan, and thence to Siberia	1,360
Antigua to Demarara, West Indies	1,308
Porto Rico to Jamaica	582
1873. Falmouth, England, to Lisbon	1,150
Valencia to Newfoundland	1,900
France to Denmark	550
Pernambuco to Para, Brazil	1,382
Alexandria, Egypt, to Brindisi, Italy	930
1874. Lisbon to Madeira	633
Valencia to Newfoundland	1,900
Madrid to St. Vincent	1,300
St. Vincent to Brazil	1,953
Jamaica to Colon, S. A.	670
West Indies to Rio Janeiro	1,940
Jamaica to Porto Rico	582
Rio Janeiro to Rio Grande de Sul	840
1875. Ireland to Rye Beach	3,000

Beside these, there are 71 ocean cables less than 100 miles long, and 40 between 100 and 500 miles long.

Important Trials in Gunnery.—Preliminary trials have now been completed with a new experimental field gun, designed in the Royal Gun Factories, at Woolwich. It is of the same weight as the 9-pounder, viz., 8 cwt., and of the same external size and appearance, but so modified in other respects that instead of a 9 lb. shot it will carry a projectile weighing about 13 lbs., while the powder charge will be at the same time increased from 1 lb. 12 oz. to 3 lbs. The caliber of the bore has been slightly increased from 3 inches to 3 1/2 inches, and the chamber has been specially contrived to carry a special cartridge, so as to consume profitably a large charge of powder in so small a gun. In the experiments which have taken place a poly-groove system of rifling has been adopted, and the new gas check has been employed to follow the grooves in the place of the usual studs, and thereby create the necessary rotation, after the plan of Capt. Blakely. The result has been greatly to increase the range of the gun, as well as the power of the shell. The velocity obtained has, with a special powder, reached as high as 1700 feet per second, and in the trials which have this week concluded, it has been shown that, with an elevation of 5°, a range of 3000 yards can be depended upon. A complete revolution in the rational field artillery may result from these experiments. Some other novelties in gunnery are being introduced by Mr. Hotchkiss, an American inventor. He is now in treaty with the French government for the manufacture of a revolving cannon, something on the Gatling principle, only that it is to carry shots of 1 lb. weight, and he is now anxious to extend his system of breech-loading to the English field guns. For this purpose he has had a gun made by Mr. Vavasseur, a steel breech-loader of about 8 cwt., which, except in having a wedge, does not differ in any important degree from the ordinary shoulder sporting rifle with the central fire. This has been fired at the Royal Arsenal proof butts, and appears to have obtained a fair amount of success.

The Calendar of the Centennial.

The following dates should be borne in mind by all who intend taking part in the Centennial: Reception of articles began January 5, 1876. Reception of articles ends April 19, 1876. Unoccupied space forfeited April 26, 1876. Exhibition opens May 10, 1876. Exhibition closes November 10, 1876. Goods to be removed by December 31, 1876.

The projectors of the Channel tunnel "report progress." An international company, it is well known, was formed, with a capital of £160,000, to be furnished in equal moieties by French and English shareholders. This first step succeeded, and the English company, which was behindhand in raising its capital, has for some time been provided with the requisite sum. A second step was then taken. The promoters were told that, as they meant to risk 4,000,000 francs, it was better that they should immediately appeal to capitalists, and constitute themselves definitely. This advice was not followed. They thought it better to risk their own capital, and not appeal to the public, until experiments had been made, and nothing was left to chance. This determination was promptly justified. The preliminary expenses have only amounted to an insignificant sum, and the promoters have already acquired a certainty that they may make decisive experiments; and when these have been made they will resolve either on the entire abandonment of the scheme, or on a definitive enterprise guarded against all eventualities and miscalculations, so that whenever they present themselves before the public they can precisely determine the time, cost and nature of the undertaking. It has been decided that an international tribunal should take the place of an International Consultative Commission, the special mission of which will be to smooth over the difficulties, leaving to each minister, as to each country, the task of settling the particular questions resting with it or within its jurisdiction. On these bases the International Convention will shortly be signed. Immediately after which the experimental company may be considered definitely formed, and will enter actively on its functions.

Microscopic slides are about the last things that one would expect to be fraudulent, but a correspondent of the London Academy says that some of the European manufacturers, who have had a good reputation hitherto, are cheating their customers. It appears that many polariscope objects are offered for sale, purporting to be plates of minerals, which are nothing more than ingenious manipulations of colored glass and cheap minerals. Thus, spartalite, for instance, is imitated by means of a piece of dark red glass, on which is placed a thin section of calcite. The combination is then mounted in Canada balsam between two plates of glass. An optician at Berlin is said to have originated these ingenious slides.

BUSINESS ITEMS.

MAINE.

The Kennebec Wire Works on Vaughn stream, in Hallowell, are running on full time, and orders are in advance to a large amount for the various grades of wire produced.

The shovel handle works, of Henry R. Butterfield, at Waterville, although running but two-thirds time since November, have averaged 4000 dozen handles per month.

VERMONT.

Mitchell & Flanders, of the Vergennes Machine Company, have closed a large contract with the authorities of the village of St. Johnsbury for the erection of their water-works. The contract is a large one, as it includes two Flanders pumps, upward of six miles of pipe, and 70 hydrants.

MASSACHUSETTS.

Twelve hours a day at the works of the Athol Machine Company.

Shut up—the Parker Mills Nail Company's Works, Wareham.

The European agents of the Fall River Cotton Mills have written that it is safe to double their shipments. If this is done one-fourth of the whole product of the mills will be exported.

At the Waltham Iron Foundry, which has been very dull of late, business have received a new impetus, large orders from the West having been received. Over 50 men are now employed, with still better prospects for the future.

The Haskins Steam Engine Company, of Fitchburg, recently shipped an engine and boiler to Rotterdam, thence to Amsterdam, Holland. This is the eighth engine this company has sent to Holland within a few months. Last week they shipped the sixth engine to Lawrence for one of her large factories, and a pair, to be used on a large derrick at the Centennial grounds in Philadelphia for unloading machinery. This company, and the Boston, Clinton and Fitchburg Railroad repair shops have begun to run full time, 10 hours per day.

Mr. Holmes Hinkley, the founder of the well known Hinkley Locomotive Works, built stationary engines as far back as 1830. This extensive establishment faces Harrison avenue and Albany street, near Dover street, Boston, and covers an area of 7 acres, beside about 65,000 square feet of flats, on which the company have ample wharf facilities for all purposes required. The main building is 600 feet in length, comprising boiler shop, blacksmith shop and foundry. The machine shop is 230 feet and 3 stories; the wood working building, 2 stories high and 110 feet in length; beside which are the tank shop, the carpenters' shop, and various other structures. A 3-story brick machine shop, 300 feet long, has recently been added to the number. It faces on Albany street, and is supplied with a 120 horse-power stationary engine, and all the most approved appliances of a first-class establishment. Here 400 hands find employment, and they are capable of turning out 12 locomotives a month. But in addition to this, they make a large number of tanks, and do all kinds of machine and blacksmith work and casting of every description.

The contract for furnishing and connecting all the steam pipe valves and fittings for the engine, boilers, machinery and steam purposes for Maci Inery Hall and annexes, at the Centennial Exposition, Philadelphia, has been awarded to the National Tube Works Co., of Boston, and McKeesport, Pa. The pipe, up to 15 inches diameter, is to be wrought iron and seamless. The National Tube Works Co. have contracted with the Walworth Mfg. Co., Boston, to furnish all the valves, fittings and other material used in completing the contract, and to engineer and construct the work.

One or two small pieces of armory machinery, from Springfield, have already been shipped to the Centennial, and the rest will probably be ready to go in about a fortnight. Lucien F. Bruce, of the machine shop, has gone down to arrange the machinery.

Col. Carroll D. Wright, of the labor bureau, has completed the industrial statistics of Springfield. In 708 manufacturing establishments, including 497 occupation establishments, such as blacksmiths' shops, etc., goods are made and work done to the amount of \$11,660,137, currency value, or of \$10,366,191 on the gold basis; against \$6,509,814, currency, and \$4,799,230, gold, in 1865. The capital invested is \$5,597,432.

The Ames Shovel Works, at Easton, have started up on full time.

CONNECTICUT.

The Frary Cutlery Company, which is to occupy the former Secor factory in Bridgeport, has a capital of \$50,000. Col. J. D. Frary, of New Britain; T. B. Perce, of Palatine Bridge, N. Y.; and the Hon. Nathaniel Wheeler and Francis Ives, Esq., of Bridgeport, are the stockholders.

The Ansonia Brass and Copper Company are running full time again, and Wallace & Sons, of Ansonia, overtime.

The Ansonia Brass and Copper Company are running full time again, and Wallace & Sons, of Ansonia, overtime. The Birmingham Optical and Needle Company owe their employees wages for six or eight weeks, and the men have quit work.

PENNSYLVANIA.

The Stewart Mill, at Sharon, has not been in operation for two or three years.

Both of the Stewart furnaces, at Sharon, are in blast, as are also the Westernman at the same place.

The Independent Phoenix says that "the hard times are over, so far as Phoenixville is concerned, in its dependence upon steady work in the Phoenix Iron Works," which are running on double time, with plenty of orders in prospect.

The West Chester Republican says that Hugh

E. Steele, Esq., of Laurel Iron Works, Chester county, has succeeded in making satisfactory arrangements with his creditors, and will continue his business without any further interruption or embarrassment.

The Argus says in about two weeks the Greenville Iron Company will have 10 more furnaces in operation.

The Wheatland Furnace and Rolling Mill are still hungry for a purchaser.

The light rails for the Dayton and Southeastern narrow gauge road are to be furnished by the Cambria Iron Works, of Johnstown.

The Wampuna Furnace is again in blast. The production of the blast furnace of the Neshaunock Iron Company, of New Castle, for the three weeks ending Saturday, Feb. 26, was 378 tons a week, being a total in three weeks of 1134 tons, of which 808 tons were No. 1 Bessemer and 326 tons No. 2 Bessemer. The furnace is 60 feet high and 15 feet across the boshes.

PITTSBURGH AND VICINITY.

We have already noted the fact, in these "Items," of the use of 3 1/2 inch tyres in the Bessemer converters at the Edgar Thomson steel works. The result from their use is most satisfactory, the new bottoms averaging fifteen blows each instead of eight under the old style and practice.

In addition to the link work on the new Point Bridge, the Pittsburgh Locomotive Works are making the iron towers, 100 feet high, over which the chains are to pass.

The Crystal Glass Works started up Monday.

The McKeesport Times says: The gas well at the Pitt Steel Works, in the Third Ward, is thought to be a success. A strong stream of salt water was struck last week, and later, gas has been found sufficient, it is thought, to supply both the steel works and tin plate works with fuel.

Wm. Smith & Co., are preparing to start their pipe works next week.

The Edgar Thomson Steel Works commenced operations double turn Monday. They have heretofore run only single turn. They have lately put in a new hot bed for straightening rails while hot, which is working to a charm.

Messrs. Graff, Bennett & Co.'s Clinton Mill has been idle for the past week, caused by breaking the fly-wheel of their engine.

Messrs. A. Garrison & Co. are busy on some work for the Centennial.

Messrs. Zug & Co. have filed a voluntary petition in bankruptcy.

Messrs. England & Brindley are manufacturing forge bellows.

WEST VIRGINIA.

All the nail mills in and about Wheeling are in full operation. This includes the Benwood, Bellaire, Belmont, La Belle, Ohio City, Riverside, Steubenville and Top Mill. Clifton is idle—reorganizing.

All of the blast furnaces in the neighborhood of Wheeling are in blast, comprising Benwood, Bellaire, Belmont and Riverside.

It is said the Riverside Nail Works, of Wheeling, are talking of starting a nail factory at Windsor, Ont.

INDIANA.

Both the Greencastle and Terre Haute mills are idle on account of a labor difficulty. These mills have heretofore been paying Cincinnati prices for boiling iron, which is 50 cents a ton advance on Pittsburgh prices. The mills demand Wheeling prices, which are only 25 cents. As both of these mills are nail mills there seems some justice in the demand.

There are in the mills of Indiana 124 nail machines. Terre Haute has 72; Greencastle, 32, and New Albany, 20. The latter is, at present, the only nail mill running in the State.

The Capital City Rolling Mill, at Indianapolis, has resumed operations, giving employment to 120 men who have been idle since its suspension.

The Ohio Falls Car Works, at Jefferson, recently turned out a number of cars, built especially for the transportation of ice.

ILLINOIS.

Hon. W. S. Brooks has lately been elected President of the Joliet Iron and Steel Works, vice J. S. Scott, resigned. The works are in full operation, with a good list of orders.

The Joseph H. Brown Iron and Steel Company, of Chicago, have decided to add blast furnaces to their works, and have let the contract for the same.

KENTUCKY.

The nail mill at Ashland was idle last week. Too large a stock on hand.

Raccoon Furnace, Greensburg, got chilled on the 7th while running on stone coal, caused by repeated breaks in her pumps and engines. This will be one difficulty in the way of running charcoal furnaces on stone coal. The machinery is not strong enough to bear the additional duty necessary for using it.

OHIO.

The furnace of the Ohio Iron Co., of Zanesville, went into blast on the 5th of September, 1871, and has been in continuously ever since. It is 16x62, making about 40 tons of metal a day on half native and half Lake Superior ores, using as fuel half coke and half Straitsville coal.

The mill of the Ohio Iron Co., Zanesville, is running single turn. It has been running double until last month.

The rail mill, at Columbus, has been running half time on reolling. They have just received an order for new work that will keep them busy for four or five months.

The old charcoal furnace at Zanesville has been completely dismantled.

Hayden's Mill, at Columbus, is running a little, mainly on iron work for the penitentiary. Mr. Hayden having a contract for the labor of the convicts, which he uses in making harness and saddlery hardware.

A number of furnaces in the Hanging Rock region have blown out, or are about to do so, and will probably never go in blast again.

Among these we have had mentioned to us, Eagle, Hope, Bloom and Latrobe.

Beside the Buckhorn, Howard and Lawrence furnaces, in the Hanging Rock region, which we have mentioned as using stone coal, we understand the old Pine Grove is making the experiment.

Ironton has 3000 tons of pig iron awaiting sale and shipment.

Howard has been running on the upper Clinton coal for two weeks, making good foundry and No. 1 mill iron, the furnace working very satisfactory. The black band ore will also undergo a trial as soon as the roads will admit of its being hauled to Howard. She has now blown out, to put in a new hearth.

The magnificent new iron structure, erected by the Cleveland Rolling Mill Company, over the site of what was formerly known as the "Old Rail Mill" having been completed, the mill started up on last Wednesday. The natives now call it the "big mill," and it is probably one of the finest and largest structures of the kind in the country. The guide mill and steel works of this company also started up on the same day.—Review of 8th inst.

The Youngstown Rolling Mill is idle this week.

The Struther's Furnace made, week before last, for the week's run, 487 tons of 1 Bessemer iron. The iron is pronounced at Johnstown as being very superior, where it is all shipped to. The furnace is 16 feet bosh, and 54 feet high. This is hard to beat.—Atlas, Gazette.

The Lake Erie Iron Co., Cleveland, are receiving an unusual large number of orders for forgings.

On last Friday morning the first heat in the new Siemens-Martin furnace, erected in the steel works of the Cleveland Rolling Mill Company, was made.—Review.

The Globe Works, Cleveland, received contracts for no less than nine steel boilers since the first of February, five of which have been completed, and four are now in course of construction.

The Cleveland Rolling Mill Company's wire mills are running to their utmost capacity, double turn, and is still behind orders. Four new frames have already been placed on the foundation for the large addition to this mill, and two more are yet to be placed. These frames contain 156 blocks, and will give employment to upward of 30 additional men.

The South Cleveland Advocate says: The contract for building the new wire mill has been let to Mr. John Watson, of this city. The contract for the machinery has been let to the firm of Turney, Parks & Co., of Cuyahoga Falls. We learn that this firm supplied the machinery for the new mill erected last year, and gives the company entire satisfaction.

Mr. J. H. Blake has sued the Hecla Iron and Mining Company, at Ironton, for the furnace property and its profits since his father's death.

The Lawrence Iron Works have an order for 60 tons of light rails of the Portsmouth street railroad. The rails are being made at Pittsburgh.

Ohio Furnace is making preparations for a 1000 ton blast for this year.

Ve-nivus Furnace will not blow in until May.

And now it is hinted that the Etta Furnace, at Ironton, may try stove coal. At this rate there will soon be no charcoal furnaces in the Hanging Rock district.

A Supposed New Metal.

A new metal, which the discoverer believes to be an element not before described, has been found at Tioga, Pa. It has been named "Motor Metal," although there does not seem to be any special appropriateness in this designation. It is found combined with iron, phosphorus and sulphur in an ore of green color, and rather peculiar appearance, and, according to the statements of Dr. Hathaway, of Tioga, the discoverer, it may be separated and reduced to metallic form by the following process: "Let the operator reduce the ore in the usual way to an impalpable powder; then place it in a glass vessel with a little water; send through it a strong current of electricity; keep the ore suspended in the water during the electrical action; continue this action for two hours, then decant the water, and dry the ore; with a strong horse shoe magnet separate all that is possible. Place that portion separated by the magnet in a small crucible with a suitable quantity of glass of borax, and bring it to a state of fusion; when the crucible is cool, break it, and a button will be found; reduce this button to a powder and digest it in pure nitric acid; filter; pour into the filtered solution nitrate of mercury; apply gentle heat; let the solution stand twelve hours; filter again; burn this; use borax glass as flux. The button will be nearly pure 'motor metal.'"

"To test it, digest the button of metal in weak hydrofluoric acid until the borax glass is dissolved. Wash the button carefully, and digest it in nitric acid. Pour into it a solution of prussiate of potash. You will have a solution colored invisible green. To test it further, dip into the green solution a white woolen cloth; let it remain thirty minutes; dry it; wash it in pure hot water and soap, and the result will be orange yellow. Aqua ammonia precipitates this metal, also acetate of lead."

Dr. Hathaway does not claim that this process gives us the metal chemically pure; but it is said to remove the iron, gold, silver, copper, platinum and mercury. The metal appears in spherical oblong crystals. It has no definite lines of cleavage, and is white in color, with a bright metallic luster. Dr. Hathaway says of its occurrence: "It has been found thus far in the county of Tioga, Pa., in what is known in the reports of Prof. Rogers as the Chemung and Catskill groups. But an extended examination is needed to determine its true geological position. Is usually combined, so far as has been discovered, with iron, cop-

per, gold; sometimes platinum, silver and gold in the same rock. All that has thus far been examined, more or less mercury has been found in the same rock. Some of the rock contains a large per cent. of the metal mercury. Combined with iron and gold, the combination appears in the form of a brown or black powder, rather coarse, resembling pieces of bark. In this condition, after electrical action upon it, it is easily separated from surrounding substances with a magnet."

Of its physical properties, Dr. Hathaway says: "In answer to the many inquiries concerning the new combination of metals, or alloy of iron discovered by me, I will give you as concise a statement as possible, with a view of enabling you to understand its action. My first experiment was for iron, and, in roasting the ore, I found what at first appeared to be mica sweat out of the ore. On being heated a little above a red heat, it brightened as the heat increased to a white heat, and on being cooled remained bright and white as silver. On heating the ore so as to flux it, this metal disappeared from the outside. I first thought it was tin, but acids dispelled this idea. I then tried it with mercury, for silver, and could not obtain a satisfactory test, but I found the ore when washed and dried to be heavier than mercury, but it would not amalgamate with the white metal. Minute particles of it was obtained in the ore, and extracted by the use of acids. Nitro-muriatic acid cuts the white metal in boiling it, turning the acid red, and aqua ammonia changes it white, giving a whitish precipitate; this washed in carbonic soda gives a grayish white powder and a bright shining metal. I tried heating the pulverized ore in a ladle, and, on giving it a white heat, it plated the ladle. I then tried sheet iron and found that it plated it also; and old rusty sheet iron was readily plated, giving it a white appearance. I now tried melting the ore in a crucible with different fluxes but got black glass. On pulverizing this the magnet would pick out much of it, in some cases getting 50 per cent. Its affinity for iron, led me to try cast iron for a flux, and I succeeded in obtaining this, to me, new metal. I had tried roasting it in a cast iron kettle, melting the outside of the bottom, leaving an inside shell, which was penetrated by the metal which changed the iron to steel and made it malleable. Further experiments showed this ore to change both cast and wrought iron to steel without melting. I tried the melted metal and found it to possess the properties of steel, hardening or annealing at a low red heat. I then tried the quantity of cast iron and ore in different proportions, and found the best results with four parts iron to one part of ore. I then used the cast iron to flux other lots of ore, and in some trials repeated ten successive heats; and in this I found the metal to crystallize in various forms, some of them very rich, and that this metal did not tarnish, the polished surface remaining bright. It has been tried with cold acids, and lastly with blood, without changing the polish. I have continued my experiments at different times, putting pieces of this new metal nearly pure in acids and caustic potash, the metal remaining bright for weeks, but on heating the potash the metal turned black, the potash brown. The pulverized ore kept in cold nitric or muriatic acid 24 hours would still plate the iron. I find the entire metal to be crystallized, and that different strata of ore gives different crystals. I find hard iron, or old burnt stove plate restored and easily fused, possessing the properties of steel while retaining the fusibility of cast iron, adapting it to all kinds of work where wear, strength, durability or finish is required. The fineness of the grain, resistance to oxidizing, makes it preferable to all other metals, taking the place of plated wares, steam works, harness and carriage trimmings, as well as cutlery. I have melted two different metals from this ore at different heats, the one soft and the other hard and fine; the softer kind shows under the microscope some of the forms of crystal seen with the iron. Cast iron is easily brought to a malleable state, having hammered it at a red heat, to less than half its thickness."

The only sample of this supposed new metal we have seen, was sent us some months ago, when the presence of some unusual element was only suspected, and when it was regarded merely as an uncommon ore of iron. The samples sent us were bars of cast iron, made from ore which had been reduced in a crucible, and poured out in sand molds. It presented some unusual superficial markings, and resisted both acids and moisture; but, on analysis, showed nothing more remarkable than iron containing both sulphur and phosphorus in uncommon proportions. The negative results of the analysis do not prove that a new element did not exist in the alloy, but merely that nothing unusual was found in the metal, except its silvery color and extreme hardness, combined with considerably more ductility than is usually found in cast iron. As those interested in the new metal have been working with it for nearly three years, the fact that they cannot classify it is, to say the least, curious.

A New System of Railway Signaling.—The Paris correspondent of the London Times says: The French Minister of Public Works has just addressed a circular to the railway companies, calling their attention to an apparatus designed to prevent the terrible accidents resulting from the inefficiency of danger signals. The question is of immediate interest on account of the lamentable accident at Abbot's Ripton, and the ministerial circular deserves, therefore, the greatest publicity. I wished, before transmitting it, to obtain information personally as to the efficiency of the system patronized by M. Caillaux. The results communicated to the companies by the circular may be considered conclusive, and seem destined to make up for the inadequacy of optical signals, which are

naturally thwarted by fog or by a sharp curve, an inconvenience which it has been attempted to remedy by fog signals. In England a mechanical contrivance has been devised putting in motion a rod which, being struck by the engine, produces a whistle; but the recent accident has proved that this device is not infallible. The system, indorsed by the Minister of Public Works seems, on the other hand, to meet every objection. It can be placed at any distance, as it acts simply by laying down a wire. The board which indicates danger in moving excites an electric current which leads to an apparatus placed in contact with the locomotive, and which produces a loud whistle. As soon as the indicator no longer represents danger the current is intercepted, and the locomotive may come in contact with the apparatus without causing a whistle. These experiments have been made during snow, and have invariably succeeded, the warning being given at a sufficient distance to allow of a train at full speed being pulled up in time.

Railroad Earnings.

The Commercial and Financial Chronicle says: Railroad earnings in the month of February were exceptionally good as compared with the corresponding month of 1875. The increase on most of the Western roads is of large amount, and taken altogether, the reports received make the most favorable showing that we have had in many months.

As to the progress of business it appears from many of the reports that the largest improvement was shown in the fourth week of the month, when the increase as compared with the same week of 1875 was quite remarkable. This was partly accounted for by the fact that there were 29 days in February this year, and the earnings of the additional day were thrown into the reports of the last week.

There was undoubtedly a large movement in February in the important articles of corn, wheat and cotton. The following shows the total earnings of the roads making returns from Jan. 1 to March 1:

ROADS EARNING FROM JANUARY 1 TO FEBRUARY 29.		1876.	1875.	Increase.
Central Pacific	\$1,861,000	\$1,861,000	\$1,861,000	\$0
Chicago & North Western	1,800,000	1,800,000	1,800,000	\$0
Chicago & Milwaukee & St. Paul	1,048,000	1,048,000	1,048,000	\$0
Chicago & Rock Island	69,723	69,723	69,723	\$0
Denver & Rio Grande	53,893	53,893	53,893	\$0
Illinois Central	1,108,573	1,108,573	1,108,573	\$0
Indiana Central	320,000	320,000	320,000	\$0
International & Great Northern	290,000	290,000	290,000	\$0
Kansas Pacific	1,123,248	1,123,248	1,123,248	\$0
Missouri, Kansas & Texas	698,854	698,854	698,854	\$0
Montana, Dakota & T. & N.	111,182	111,182	111,182	\$0
St. Louis & North Western	78,001	78,001	78,001	\$0
St. Louis & San Francisco	520,821	520,821	520,821	\$0
St. Louis & S. Eastern	150,000	150,000	150,000	\$0
Tulsa, Fort & Weymouth	1,221,000	1,221,000	1,221,000	\$0
Wabash	1,100,000	1,100,000	1,100,000	\$0
Wichita & Santa Fe	78,000	78,000	78,000	\$0
Winnipeg & Hudson Bay	1,101,931	1,101,931	1,101,931	\$0
Total	\$11,230,503	\$11,230,503	\$11,230,503	\$0

Railway Gauge Changes.—On Saturday

it was announced on authority that the Lackawanna Iron and Coal Company and the Cambria Iron Company have agreed to furnish a third steel rail for the Erie Railway from Waverly east to Jersey City. This will complete the standard gauge over the entire road from Buffalo and Suspension Bridge to Jersey City, the Lehigh Valley Railroad Company having already agreed to furnish the third steel rail from Waverly west to Buffalo. The Delaware and Hudson and the Delaware, Lackawanna and Western companies are to appropriate, by agreement with the Erie, one twenty-fourth part of their transportation earnings each month for two years to pay for the cost of the third rail from Waverly east to Jersey City. The Delaware, Lackawanna and Western are now narrowing their gauge, and the Delaware and Hudson have just completed the same work. These coal companies have existing contracts for transportation of coal, and all now being standard gauge roads, the purpose of narrowing the Erie gauge can be seen. It will also be observed that the Lehigh Valley arrangement gives the Erie a direct route from the West into Philadelphia by way of the Lehigh Valley. North Pennsylvania and Reading roads. This arrangement also gives the Erie the advantages of connecting with the standard gauge roads of the West—the Lake Shore, Canada Southern, Michigan Central, &c.

J. Christopher Friedman and Charles R. Lauterjung, importers and dealers in cutlery, 9 Chambers, have begun suit in the Supreme Court against George Kracke for slander. Kracke was in their employ until November last, when he was discharged. He then, as alleged, went to various places and accused his late employers of smuggling. Kracke has been arrested and held to bail in \$10,000.

The business men of Chicago, who up to this time have been exchanging congratulations over the condition and prospects of trade, are just now a trifle despondent. The Chicago Tribune, in a lament over the general stagnation, says that "There is a show of speculation in the Board of Trade, but it has fallen vastly from the proportions of former years, and is hardly an appreciable element in the financial situation. Collections are more than poor, particularly from points south of this city." Chicago is so accursed a place that its papers are apt to have fits of buoyancy and despondency in quick alternation. At present they have clearly a slight touch of the "blues," but we shall be disappointed if this is not soon succeeded by a more cheerful feeling.

Forehand & Wadsworth's Double-Action



WROUGHT IRON FRAME.
Cast Steel Barrel and Cylinder.
32, 38 and 41 Cal.

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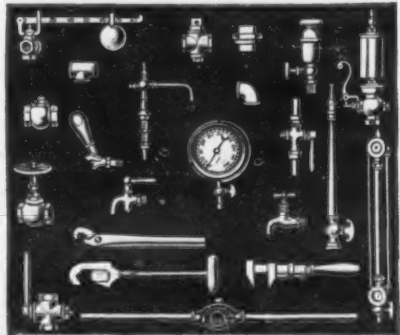
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TRADE MARK
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White Lead (Atlantic), Red Lead,
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Established A. D., 1777.
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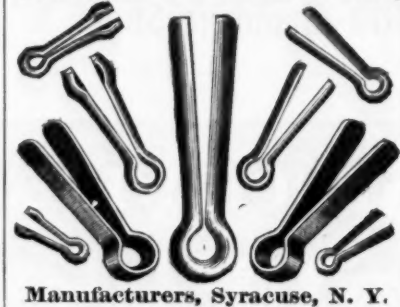
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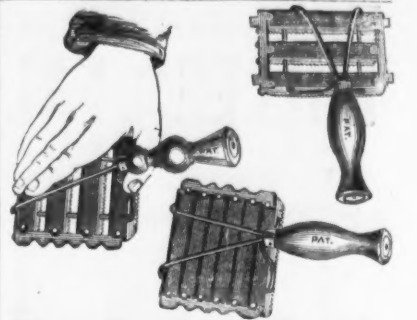
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The Perfect Comb.

We call your attention specially to our new patent end-
less wire frame comb. The result of a long series of ex-
periments, made with a view to meeting all the require-
ments of a Perfect Comb. It is better, stronger, and
more durable than any ever before invented. The raised
wire shank gives what has never before been attained,
viz: a rest and brace for the thumb, in such a position
that the hand cannot come in contact with the horse
while using the comb. The wire braces which run from
the shank over the back to the front teeth give strength
and durability in a direction never heretofore attained,
and at the same time serve as an extra handle; and
when clasped by the fingers in connection with the raised
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possible in any other formation—in short, it needs but a
trial to vindicate a name: **The Perfect Comb.**

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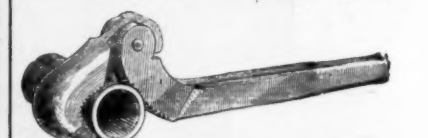
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Double Beam R. R. Truck Scale, Com-
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First Power Lever Wagon Scales. Testing
Machines any capacity.
Send for Illustrated Price List.

**GOLD MEDAL
Non-Extensible Razor Belt.**

PATENTED JULY 25, 1871.

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In this Strap the liability of the leather to stretch and become loose and porous is prevented by the
a patented non-extensible base, which supports the leather and secures

PERMANENT ELASTICITY.

We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality
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The National Steel Tube Cleaner.



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Guaranteed to clean better, last longer and work easier than any in the market. Removes all Carbon and Scale
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National Fire Brick & Drain Pipe Wks,
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 Manufacture **FIRE BRICK** all shapes and sizes.
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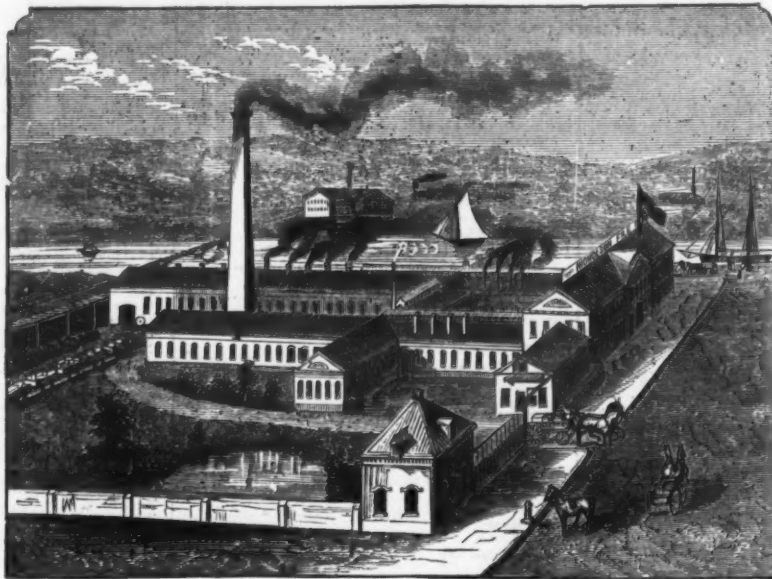
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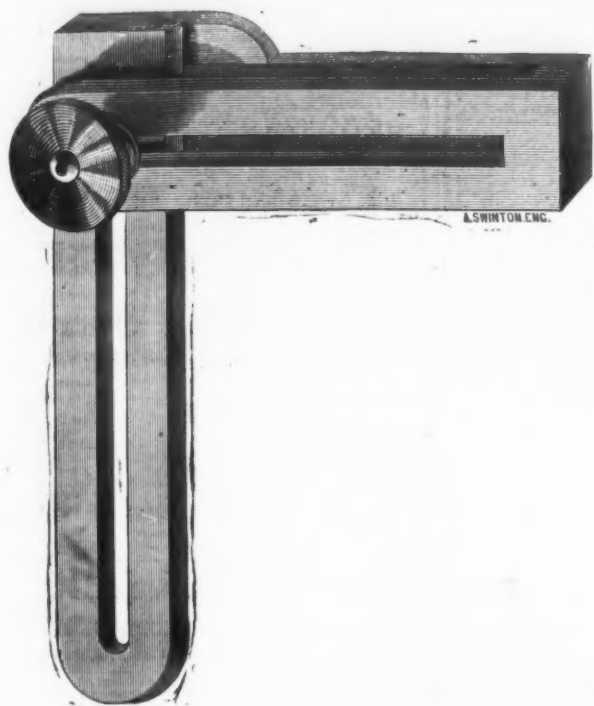
No Patent, No Pay. Send for Circular.

PATENTS.

Send for circular.

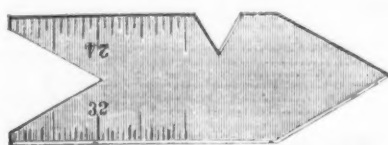
Keystone Saw, Tool, Steel and File Works, HENRY DISSTON & SONS,

Front and Laurel Streets, Philadelphia.



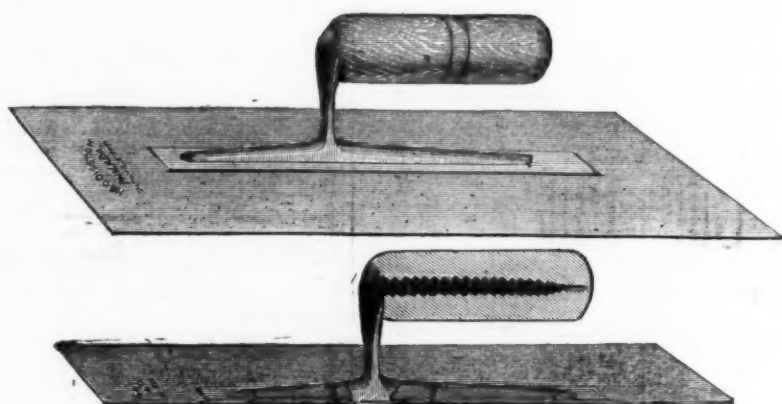
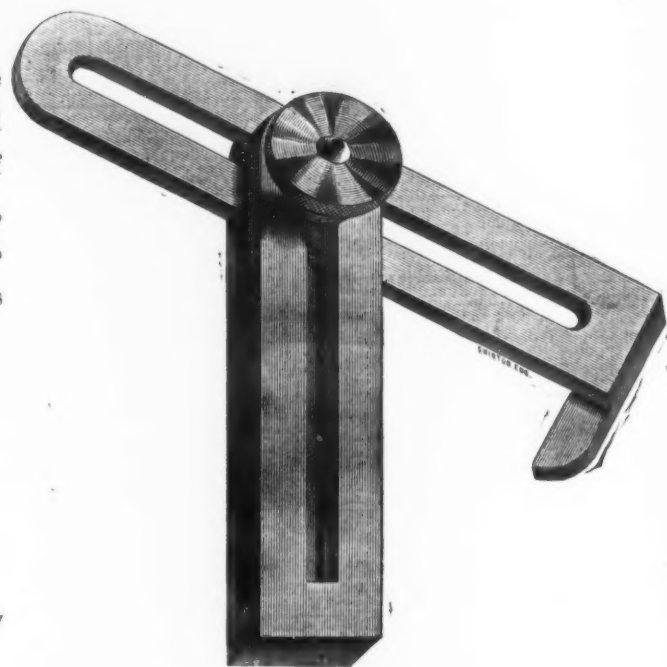
IMPROVED SQUARE AND BEVEL.

The accompanying cuts represent an Improved Square and Bevel, designed as a Square. The blade can be moved up and down in the stock at pleasure, so that the Butt of Square shall not come in the way of Bench or any other tool, as the old fashioned Square does. It can also be turned into a Bevel, at pleasure. We think for some kinds of work it is just right.



CENTER GAUGE.

A Machinist Center Gauge and Gauge for Grinding and Setting Screw Tools by.

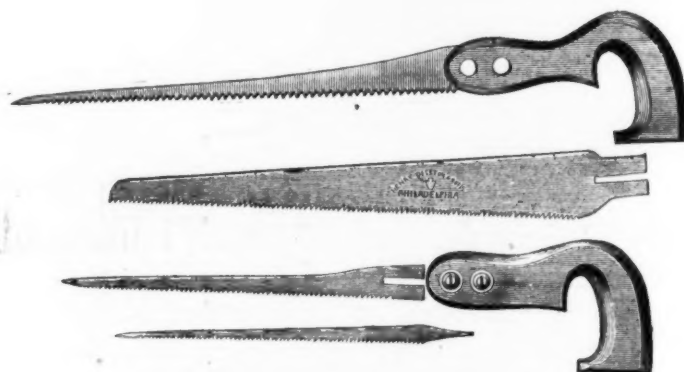


SECTIONAL VIEW.

PLASTERERS' TROWELS.

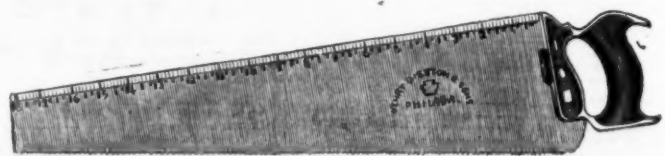
The attention of Plasterers is called to the above cuts of our new Plastering Trowel No. 0, for which we have received Letters Patent of the United States, dated April 20, 1875.

We warrant this Trowel to be superior to any other in the market, and guarantee it to give entire satisfaction. Our improvement consists in making a Plastering Trowel with a central longitudinal rib, giving thereby additional strength and at the same time allowing the use of rivets with larger heads, thus securing the mounting more permanently to the blade. The Trowel is light, yet stiff, and will not lose its shape through friction as most Trowels do.



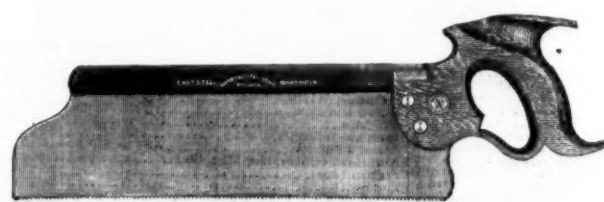
COMPASS SAWS.

Our new Compass Saw is a great improvement on the style in common use—with it the operator need not bring his hand in contact with the saw blade when extra power is required, as provision is allowed in the handle for two full hand grips. They are cheaper than common Compass Saws, when you consider that broken blades can be renewed at a small cost, whereas in the old style, when the blade is broken, the whole tool is useless. We advance one size in price for our New Patent Handle, i. e. for 10 inch blade and new Handle, we charge 12 inch price. The blades are sold in nests, or separately, and are interchangeable.



THE COMBINATION SAW.

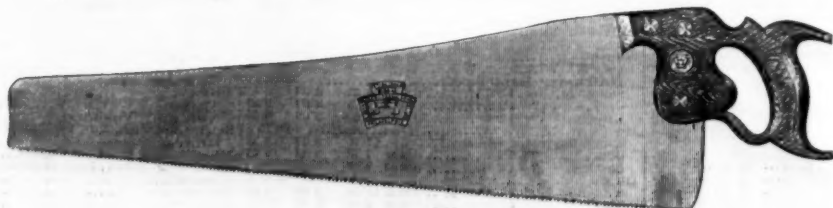
The Combination Saw, which we illustrate herewith, is an article which fills a long felt want: it combines five tools in one, each tool as light as any one of the tools in separate form. This combination being made entirely of metal, and put together with metal, is always firm and true. No shrinkage can affect it. It is the most complete weather board Saw in the world, and with our little Pocket Level it presents a complete Plumb and Level, a Hand Saw, a good Square, and Rule.



NEW PATTERN BACK SAW.

The recess on the side of the handle to admit the thumb is a grand improvement, as the hand is not cramped, but feels very comfortable.

"CENTENNIAL No. 76."



This Saw is ground on the back, to taper gradually from butt to point, being only 26 gauge at the point. By this mode of grinding, the Saw, when tested, makes a complete "whip bend." The handle is apple-wood, oil finish, the screws are flush and polished, and the Saw is superior to any ever offered to the trade in this or any other country at the price. It is the sweetest-cutting, nicest-hanging Saw that can possibly be manufactured, feeling as light as a feather at the point, owing to its peculiar construction. The screws are finished before being put into the handle, and, should they become loose, can be readily tightened with an ordinary screw-driver, and still make a good finish.

New York Wholesale Prices, March 15, 1876.

HARDWARE.

ANVILS.	
American, 150 lb, 100 lb, 75 lb, 50 lb, 25 lb, 10 lb, 5 lb, 2 lb, 1 lb, 1/2 lb, 1/4 lb, 1/8 lb, 1/16 lb, 1/32 lb, 1/64 lb, 1/128 lb, 1/256 lb, 1/512 lb, 1/1024 lb, 1/2048 lb, 1/4096 lb, 1/8192 lb, 1/16384 lb, 1/32768 lb, 1/65536 lb, 1/131072 lb, 1/262144 lb, 1/524288 lb, 1/1048576 lb, 1/2097152 lb, 1/4194304 lb, 1/8388608 lb, 1/16777216 lb, 1/33554432 lb, 1/67108864 lb, 1/134217728 lb, 1/268435456 lb, 1/536870912 lb, 1/1073741824 lb, 1/2147483648 lb, 1/4294967296 lb, 1/8589934592 lb, 1/17179869184 lb, 1/34359738368 lb, 1/68719476736 lb, 1/137438953472 lb, 1/274877906944 lb, 1/549755813888 lb, 1/1099511627776 lb, 1/2199023255552 lb, 1/4398046511104 lb, 1/8796093022208 lb, 1/17592186044416 lb, 1/35184372088832 lb, 1/70368744177664 lb, 1/140737488355328 lb, 1/281474976710656 lb, 1/562949953421312 lb, 1/1125899906842624 lb, 1/2251799813685248 lb, 1/4503599627370496 lb, 1/9007199254740992 lb, 1/18014398509481984 lb, 1/36028797018963968 lb, 1/72057594037927936 lb, 1/144115188075855872 lb, 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1/2475880078570760549798248448 lb, 1/4951760157141521099596496896 lb, 1/9903520314283042199192993792 lb, 1/19807040628566084398385987584 lb, 1/39614081257132168796771975168 lb, 1/79228162514264337593543950336 lb, 1/158456325028528675187087900672 lb, 1/316912650057057350374175801344 lb, 1/633825300114114700748351602688 lb, 1/1267650600228229401496703205376 lb, 1/2535301200456458802993406410752 lb, 1/5070602400912917605986812821504 lb, 1/10141204801825835211973625643008 lb, 1/20282409603651670423947251286016 lb, 1/40564819207303340847894502572032 lb, 1/81129638414606681695789005144064 lb, 1/162259276832213363391578010288128 lb, 1/324518553664426726783156020576256 lb, 1/649037107328853453566312041152512 lb, 1/1298074214657706907132624082305024 lb, 1/2596148429315413814265248164610048 lb, 1/5192296858630827628530496329220096 lb, 1/10384593717261655257060992658440192 lb, 1/20769187434523310514121985316880384 lb, 1/41538374869046621028243970633760768 lb, 1/83076749738093242056487941267521536 lb, 1/166153499476186484112975882535043072 lb, 1/332306998952372968225951765070086144 lb, 1/664613997904745936451903530140172288 lb, 1/1329227995809491872903807060280344576 lb, 1/2658455991618983745807614120560689152 lb, 1/5316911983237967491615228241121378304 lb, 1/10633823966475934983230456482242756608 lb, 1/21267647932951869966460912964485513216 lb, 1/42535295865903739932921825928971026432 lb, 1/85070591731807479865843651857942052864 lb, 1/170141183463614959731687303715884105728 lb, 1/340282366927229919463374607431768211456 lb, 1/680564733854459838926749214863536422912 lb, 1/1361129467708919677853498429727072845824 lb, 1/272225893541783935570699685945414569152 lb, 1/544451787083567871141399371890829138304 lb, 1/1088903574167135742282798743781658276608 lb, 1/2177807148334271484565597487563316553216 lb, 1/4355614296668542969131194975126633106432 lb, 1/8711228593337085938262389950253266212864 lb, 1/17422457186674171876524779900506532425728 lb, 1/34844914373348343753049559801013064851456 lb, 1/69689828746696687506099119602026129028112 lb, 1/139379657493393375012198239204052258056224 lb, 1/278759314986786750024396478408104516112448 lb, 1/55751862997357350004879295681620903222496 lb, 1/111503725994714700009758591362418406444992 lb, 1/223007451989429400019517182724836812889984 lb, 1/446014903978858800039034365449673625779968 lb, 1/892029807957717600078068730899347251559936 lb, 1/1784059615915435200156137461798694503119872 lb, 1/3568119231830870400312274923597389006239744 lb, 1/7136238463661740800624549847194778012479488 lb, 1/1427247692732348160124909969438955602495896 lb, 1/2854495385464696320249819938877911204991792 lb, 1/5708990770929392640499639877755822409983584 lb, 1/11417981541858785280999279755511644819967168 lb, 1/22835963083717570561998559511023289639934336 lb, 1/45671926167435141123997119022046579279868672 lb, 1/91343852334870282247994238044093158559737344 lb, 1/182687704669740564495984476088186317119474688 lb, 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1/6277101735502737642518656384979633951862629677278429184 lb, 1/12554203471005475285037312769959267903725259354556858368 lb, 1/25108406942010950570074625539918535807450518709113716736 lb, 1/50216813884021901140149251079837071614901037418227433472 lb, 1/100433627768043802280298502159674143229802074836454866944 lb, 1/200867255536087604560597004319348286459604149672909733888 lb, 1/401734511072175209121194008638696572919208299345819467776 lb, 1/803469022144350418242388017277393145838416598691638935552 lb, 1/1606938044288700836484776034554786291676831197383277871104 lb, 1/3213876088577401672969552069109572583353662394766555742208 lb, 1/6427752177154803345939104138219145166707324789533111484416 lb, 1/12855504354309606691878208276438290333414649579066222968832 lb, 1/25711008708619213383756416552876580666829299158132445937664 lb, 1/51422017417238426767512833105753161333658598316264891875328 lb, 1/102844034834476853535025666211506322667317196632529783750656 lb, 1/205688069668953707070051332423012645334634393265059567501312 lb, 1/411376139337907414140102664846025290669268786530119135002624 lb, 1/822752278675814828280205329692050581338537573060238270005248 lb, 1/1645504557351629656560410659384101162677075146120476540010496 lb, 1/3291009114703259313120821318768202325354150292240953080020992 lb, 1/6582018229406518626241642637536404650708300584481906160041984 lb, 1/13164036458813037252483285275072809301416601168963812300083968 lb, 1/26328072917626074504966570550145618602833202337927624600167936 lb, 1/52656145835252149009933141100291237205666404675855249200335872 lb, 1/105312291670504298019866282200582474411332809351710498400671744 lb, 1/210624583341008596039732564401164948822665618703420996801343488 lb, 1/421249166682017192079465128802329897645331237406841993602686976 lb, 1/842498333364034384158930257604659795290662474813683987205373952 lb, 1/1684996667328068768317860515209319585801324949627367974410747904 lb, 1/3369993334656137536635721030418639171602649899254735948821495808 lb, 1/6739986669312275073271442060837278343205299798509471897642991616 lb, 1/13479973338624550146542884121674566886410595977018943755285983232 lb, 1/26959946677249100293085768243349133772821191954037887510571966464 lb, 1/53919893354498200586171536486698267545642383908075775021143932928 lb, 1/107839786708996401172343072973396535091284767816151550042287865856 lb, 1/215679573417992802344686145946793070182569535632303100084575731712 lb, 1/431359146835985604689372291893586140365139071264606200169151463424 lb, 1/862718293671971209378744583787172280730278142529212400338302926848 lb, 1/1725436587343942418757489167574344561460556285058424800676605853696 lb, 1/3450873174687884837514978335148689122921112570116849601353211707392 lb, 1/6901746349375769675029956670297378245842225140233699202706423414784 lb, 1/13803492698751539350059913340594756491684450280467398405412846829568 lb, 1/27606985397503078700119826681189512983368900560934796810825693659136 lb, 1/55213970795006157400239653362379025966737801121869593621651387318272 lb, 1/110427941590012314800479306724758051933475602243739187243302774636544 lb, 1/220855883180024629600958613449516103866951204487478374486605549273088 lb, 1/441711766360049259201917226899032207733902408974956748973211098546176 lb, 1/883423532720098518403834453798064415467804817949913497946422197092352 lb, 1/1766847065440197036807668907596128830935609635899826995892844394184704 lb, 1/3533694130880394073615337815192257661871219271799653991785688788369408 lb, 1/7067388261760788147230675630384515323742438543599307983571377576738816 lb, 1/14134776523521576294461351260769030647484877087198615967142755153477632 lb, 1/28269553047043152588922702521538061294969754174397231934285510306955264 lb, 1/56539106094086305177845405043076122599939508348794463868571020613910528 lb, 1/113078212188172610355690810086152245199879016697588927737142041227821056 lb, 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1/926336714245510024033819116225759192677408904786648496022667601738310090752 lb, 1/1852673428491020048067638232451518385354817809573296992045335203476620181504 lb, 1/3705346856982040096135276464903036770709635619146593984090670406953240363008 lb, 1/7410693713964080192270552929806073541419271238293187968181340813906480726016 lb, 1/1482138742792816038454110585961214708283854256588637593636268162781296145232 lb, 1/2964277485585632076908221171922429416567708513177275187272536325562592290464 lb, 1/5928554971171264153816442343844858833135417026354550374545072651125184580928 lb, 1/11857109942342528307632884687689717666270834052709100749090145302250369161856 lb, 1/23714219884685056615265769375379435332541668105418201498180290604500738323712 lb, 1/47428439769370113230531538750758870665083336210836402996360581209001476647424 lb, 1/94856879538740226461063077501517741330166672421672805992721162418002953294848 lb, 1/189713759077480452922126155003035482660333344843357611	

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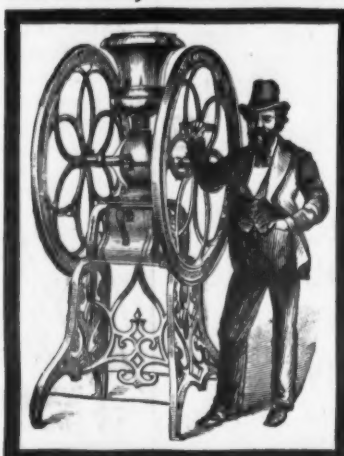
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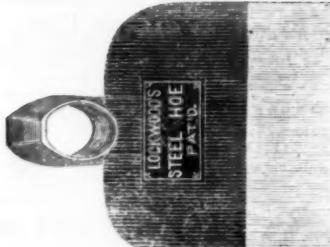


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Connecticut Valley Anger Bit..... dis 40

Cook's Bit..... dis 40

Jennings' Bit..... dis 40

States' Nut Anger..... dis 40

Douglas & Iron Anger..... dis 40

Watson's Nut Anger..... dis 40

Honey's Pat. Hollow Augers..... dis 25

Stearns' Patent Hollow Augers..... dis 25

Balances.—

Landers, Frary & Clark's..... Sold on Morton's new

Morton's..... List..... dis 30

Charlton's..... dis 30

Common Spring with Hook..... dis 30

Bells..... dis 30

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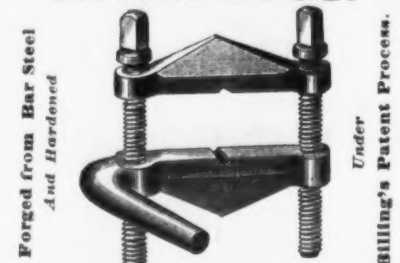
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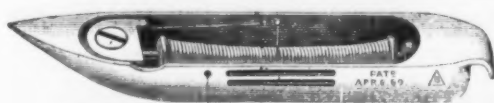
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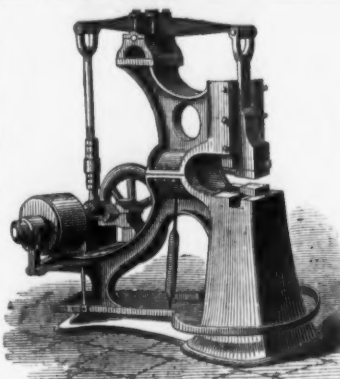
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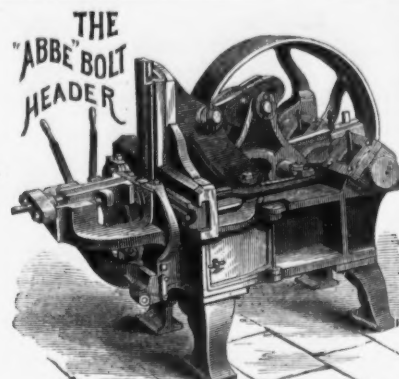
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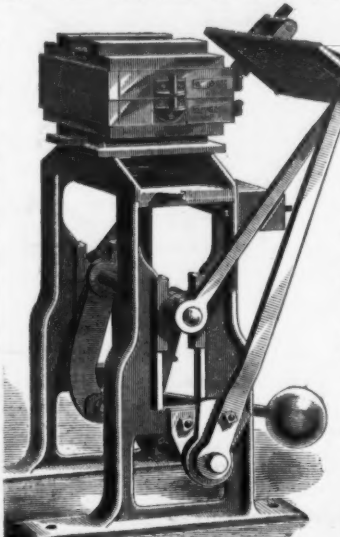
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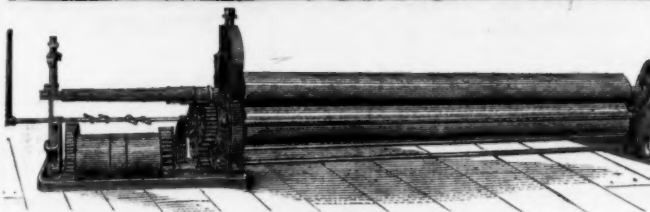
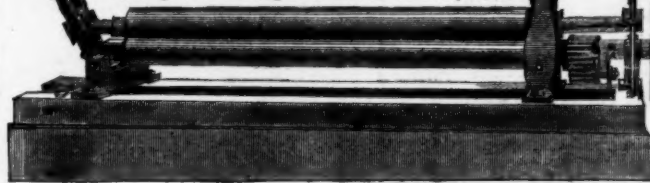
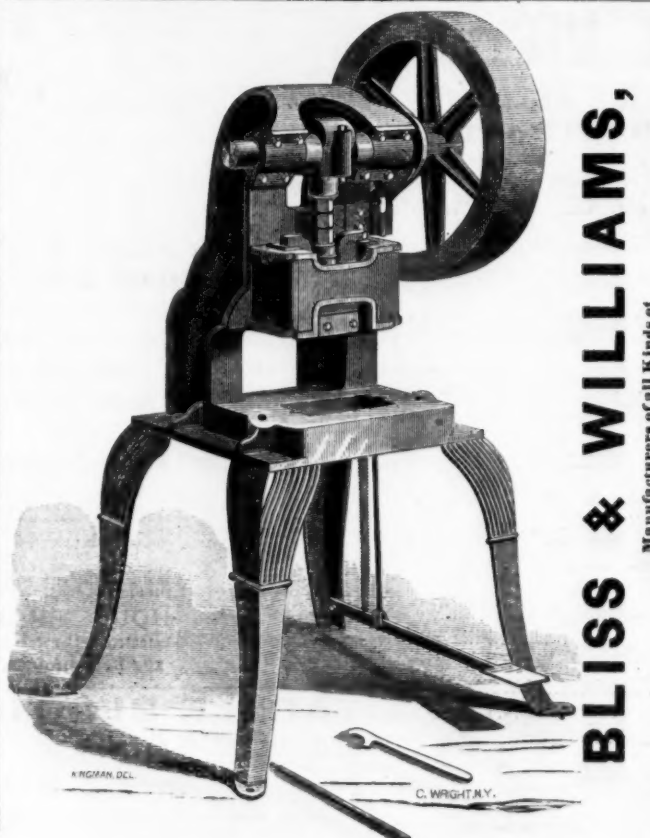
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All sizes in stock. Socket Shafts, Ring Han-
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Also Tensioning Tools for joining log ends.**CROOK, HERRING & CO.,**Pattern and Model Makers,
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the Centennial. Experimental and Patent Office Models.**STEAM
PUMPS**

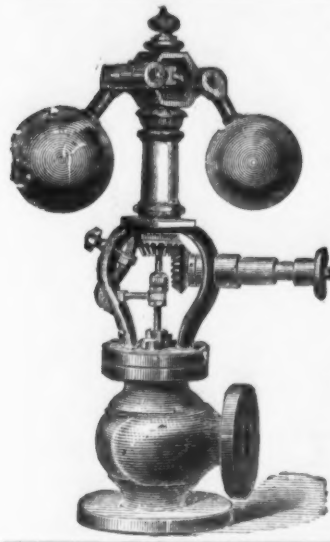
Manufactured by

Cranes Bros. Mfg. Co.

CHICAGO.

COOKE & BEGGS, Agts

16 Cortlandt St., N. Y.



TO ALL WHO USE STEAM-POWER!

We will put our Governor on any Engine, and guarantee it to prove itself superior to all others. If, after a fair trial, it does not, we will take it off at our own expense.

Shive Governor Co.

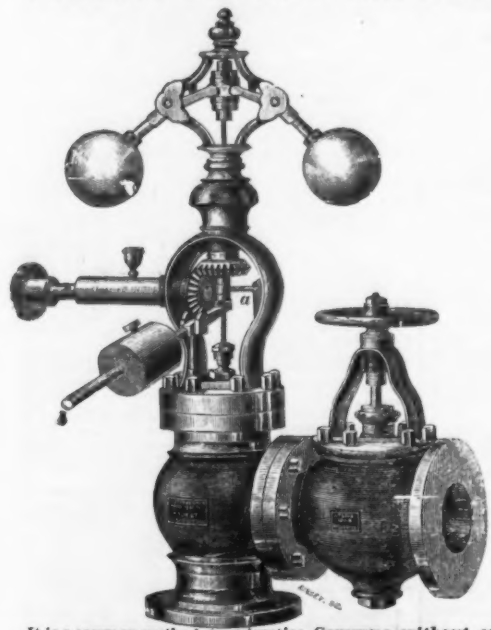
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SHIVE'S PATENT WATCHMAN'S CLOCK AND DETECTOR,

Buoy's Patent Counter Scale, No Nest of Weights.

Circulars sent free

JUDSON PATENT IMPROVED GOVERNORS.



When Governors are ordered, be particular and say Governor with Stop Valve, or without Stop Valve; and either Plain or Bright Finish, as you may require, and with or without Lever Attachment. For dimensions and other particulars send for Illustrated List.

Capacity of Valve or Port in Inches	PRICE.			
	Plain.	Bright Finish.	Lever Attachment for altering speed.	Improved Stop Valve.
1/4	17.00	19.00	1.90	..
1/2	19.00	21.00	1.90	..
3/4	21.00	24.00	2.00	5.00
1	25.00	28.00	2.25	6.00
1 1/4	29.00	33.00	2.50	8.00
1 1/2	32.00	40.00	2.75	10.00
1 3/4	40.00	48.00	3.25	14.00
2	45.00	51.00	3.50	15.00
2 1/4	49.00	56.00	3.75	17.00
2 1/2	55.00	63.00	4.25	20.00
2 3/4	64.00	73.00	4.50	25.00
3	74.00	84.00	5.00	30.00
3 1/4	86.00	97.00	5.50	35.00
3 1/2	94.00	105.00	6.00	42.00
3 3/4	112.00	125.00	6.50	48.00
4	125.00	138.00	7.00	54.00
4 1/4	150.00	167.00	8.00	68.00
4 1/2	185.00	202.00	9.00	80.00
4 3/4	205.00	225.00	10.00	..

No Charge for Box and Carriage.

It is a common method to advertise Governors without cost, unless satisfactory to the customer, and then charge High Prices for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the price, but becoming useless after a year's wear—their construction lacks durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the above list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

JUNIUS JUDSON & SON, Rochester, N. Y.

The Pratt & Whitney Co.,
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Have constantly on hand and making

Drop Hammers

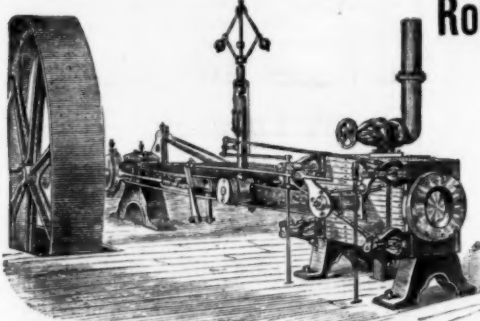


Of recently Improved Construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c., &c.

Robt. Wetherill & Co.
CHESTER, PA.

Corliss Engine BUILDERS.

Shafting & Gearing.
Boiler Makers.



THORNE, DeHAVEN & CO.

21st Street, above Market,
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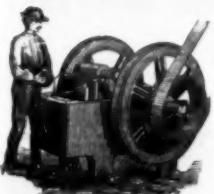
DRILLING MACHINES.



PORTABLE DRILLS. Driven by power in any direction, self-feed and convenient adjustment.
RADIAL DRILLS. Self-feed—large adjustable box table—separate base plate, every convenience.
VERTICAL DRILLS. Self-feeding—of new and improved designs.
MULTIPLE DRILLS. For boiler work, etc., 2 to 20 spindles, fed and returned by power or hand, together or separately.
HORIZONTAL BORING AND DRILLING MACHINES. For large pieces—with boring head, adjustable, vertically and horizontally.
SPECIAL DRILLS. For special work. Gun Blank Drills, Coal Drills, &c., built to order.

BLAKE'S PATENT STONE & ORE BREAKER.

New Pattern with Important Improvements & Abundant Strength



For reducing to fragments all kinds of hard and brittle substances, such as STONE for making the most perfect MACADAM ROADS, and for making the best CONCRETE. It breaks stone at trifling cost for BALLASTING RAILROADS. It is extensively in use in MINING operations, for crushing

IRON, COPPER, ZINC, SILVER, GOLD, and other ORES. Also for crushing Quartz, Flint, Emery, Corundum, Feldspar, Coal, Barytes, Manganese, Phosphate Rock, Plaster, Soapstone, &c. For Illustrated Circulars, and particulars, address,

BLAKE CRUSHER CO., New Haven, Conn.



ESTABLISHED 1832.
THE BRADLEY MFG. CO., Syracuse, N. Y.

MANUFACTURERS OF

Wrought Iron CARRIAGE STEPS

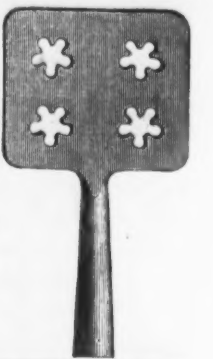
MADE WITH

Bradley's Cushioned Hammer

EQUAL TO THE BEST.

Liberal discount to the Trade.

Send for Prices.



Knowles Patent Steam Pumps

MANUFACTURED BY THE

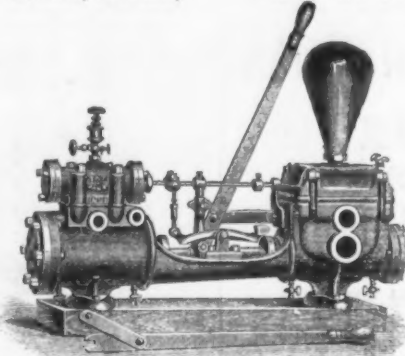
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WARREN, MASS.

WAREHOUSES:

14 & 16 Federal Street, Boston,

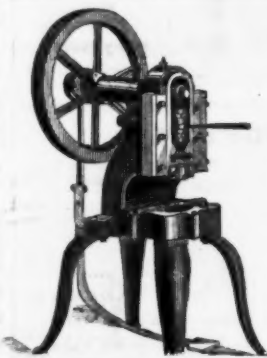
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Cut above represents regular Boiler Feed Pump, No. 3 and 4. Showing New Patent Valve Motion, and Hand Power LEVER Attached and Detached.

FIRE PUMPS, a specialty.

Mining Pumps (both Double Acting Plunger, and Piston Pattern,) which we guarantee to run absolutely noiseless on any lift from 100 to 600 ft., at a single lift, a specialty. Pumps for every possible duty. Prices as low as any, and our workmanship and material altogether the Best. Every machine furnished under a complete guarantee.



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Punching Presses.

Patentee and Sole Manufacturer.

I warrant every part of this Machine to stand the shock of the wheel running at 175 revolutions.

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HAMMER & CO.,

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Manufacturers of the following Patented Articles of

MALLEABLE IRON:

Hammer's Adjustable Clamps.
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For Sale by all the principal Hardware Dealers.

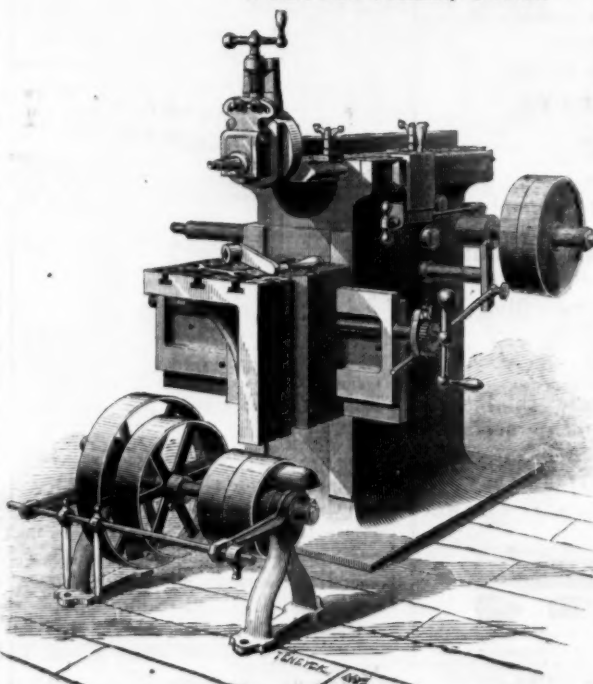
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Of Superior Quality made to order

THE HENDEY MACHINE CO.

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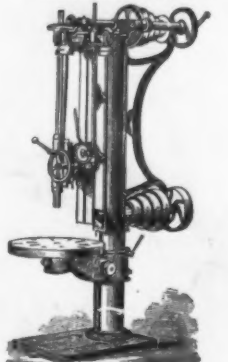
THE MANVILLE
Patent Planers and Shaping Machines.
WOLCOTTVILLE, CONN.



Any length of stroke from 3/4 to 24 inch in length, while machine is running with perfect uniformity of speed of cutting tool. Automatic cross feed of 19 inch and 16 inch, from top of table to bottom of slide when table is down. Send for Circular and Price List.

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Manufacturer of the

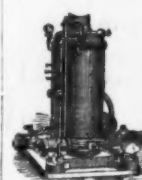


"BLAISDELL" UPRIGHT DRILLS,
And other First-Class Machinists' Tools.

IMPROVED Engine Lathes

SCREW MACHINES, &c.

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The Whitmore Engine.
SAFEST, CHEAPEST & BEST.

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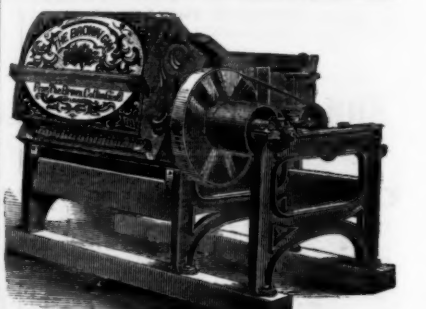
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PHILADELPHIA, PA.

Sole Manufacturers
Engines, Boilers and
Steam Pumps.

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NEW MACHINERY WAREHOUSES

915 Market Street, Philadelphia.

Hampson, Whitehill & Co.'s Stationary, Portable and Rolling Steam Engines; Shive Governors, a Sure Regulator; Machinists' Tools, (the Pratt & Whitney Co.'s), of world-wide reputation; Knowles and Pulsometer Steam Pumps; Jones' Scales, "The Test," Union Emery Wheels, and General Machinery.



The Brown Cotton Gin Co.

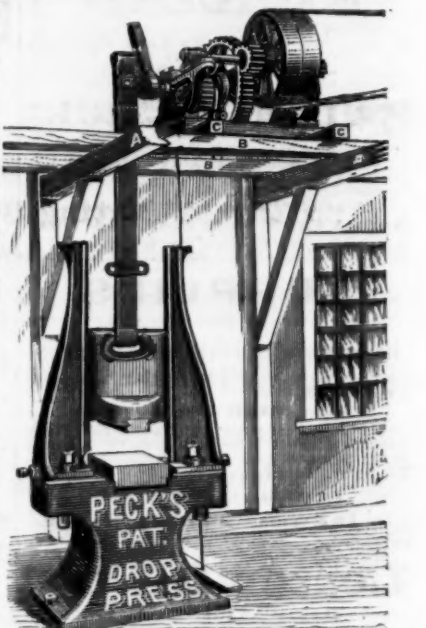
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THE BROWN COTTON GIN,
Isaac F. Brown's Patent

Cotton Gin Feeder & Condensers.

Also Cotton Gin Saws, Ribs and other materials for Gin makers and Repairs.

NEW LONDON, CONN.



I have the largest and best stock of Drop Press Patterns in the country—suitable for Forging, and all kinds of Sheet Metal work.

WHY THE BEST:

It requires less power, works faster, gives a harder blow with same weight of hammer, the rebound of the hammer is caught without lessening the force of the blow, the blow is uniform and not affected by variations in the speed of the driver. It is always in order. The Drop Press is a specialty.

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Machinery, &c.

THE
Shapley Engine

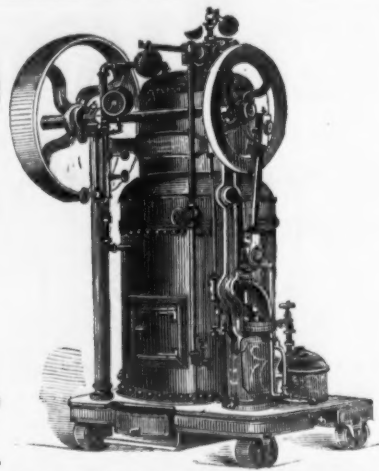
Patented Feb. 10, 1874.

COMPACT,
PRACTICAL,
DURABLE,
ECONOMICAL.

\$200.00.

Cheaper than any Engine offered of
the same capacity.

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SHAPLEY & WELLS,
Binghamton Iron Works,
Binghamton, N. Y.Manufacturers of Steam Engines, Boilers, Water Wheels, Circular Saw Mills and
Mill Work generally.

Ludlow Valve Mfg. Co.,

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VALVES

(Double and Single Gate, 1/4 in. to 48 in.—outside and inside Screws, Indicator, &c.)
for Gas, Water and Steam. Send for Circular.

Also FIRE HYDRANTS.

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(Successor to MATTHEWS & MOORE,)

Engineer, Machinist, Founder and Boilermaker

CASTINGS of every description.

ROLLING MILL AND FURNACE EQUIPMENTS COMPLETE

Rolls Turned for Rails, Beams, Angles, and all shapes for Iron, Steel, or
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AND MILLWRIGHTING IN GENERAL.BOILERS—FLUE, TUBULAR AND CYLINDER, and all kinds of
TANK AND PLATE IRON WORK.WILSON MANUFACTURING COMPANY.,
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MANUFACTURERS OF

SOLID BOX VISES.

With or without Convex and Concave Washers.

Jackscrews, Braces, Coffee Mills, Turning Lathes, Clamp
Heads and Screws; Parallel Bench Vises, Sash Pullies, Ho
House Pullies, Composition Cocks, Bench Screws, Vise Screws,
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Riggers' Screws, Caulkers' Tools, Pump Chambers, Belaying
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MAKER AND PATENTEE OF.

Hydraulic Jacks and Punches,

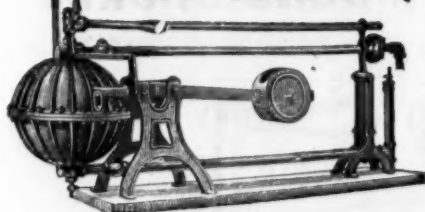
ROLLER TUBE EXPANDERS

And Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.

JACKS for Pressing on Car Wheels or CRANK PINS made to order

The Albany Steam Trap.

This Trap automatically drains the water of
condensation from Heating Coils, and re-
turns the same to the Boiler whether the Coils
are above or below the water level in Boiler, thus
doing away with pumps and other mechanical
devices for such purposes. Apply toAlbany Steam Trap Company,
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SAMUEL A. GODDARD & CO.,

Commission Merchants and General Agents,

execute orders for British manufacturers on the lowest
terms, and collect and forward goods for a very mod-
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THE EXCELSIOR DRY LEVEL.—Patented.

Works by gravity; warranted true; no glass to break;
does not get out of order easily; graduated for de-
grees and feet and inches. Prices, \$1.50 to \$10, according
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H. S. TARR & SON, 710 Green St., Phila.

Machinery, &c.

Established 1848.

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Engineers, Iron Founders and Machinists.

RAILWAY SHOP EQUIPMENTS.

Our Steam Hammers, Lathes, Planers, Drills and Bolt Cutters
Are of Improved and Patented Construction.Railway Turning and Transfer Tables,
SHAFTING & MILL GEARING, a specialty.

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GIFFARD'S INJECTOR—IMPROVED, SELF-ADJUSTING.

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Manufactures as Specialties

POWER LOOMS,
SPOOLING, BEAMING, DYEING and
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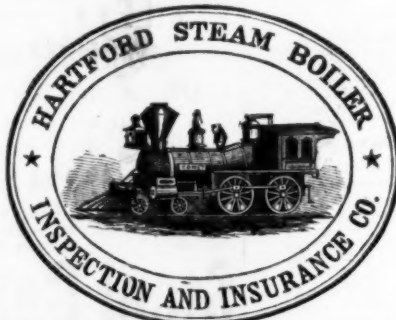
PATENT BOBBIN WINDING MACHINES
wind direct from
hank or skein to shuttle bobbin.

SHAFTING
With Patent Adjustable self-oiling Bearings.
Adjustable Self-Oiling Hangers,
8, 10, 12, 15 and 18 in drop,
Ball and Socket Self-Oiling Pillow Blocks.
Pulleys, from 4 inch to 10 feet in diameter.
Pulleys made in two parts,
any size required.

SELF-ACTING WOOL-SCOURING MACHINES,
LARD AND PARAFFINE OIL PRESSES.

Improved
Power Hoisting Machines.
Machine and Foundry Work in all
their branches.

Plans taken, and Factories fitted out com-
plete with shafting and Gearing
Send for list of Pulleys, &c.
THOMAS WOOD.

Issues Policies of Insurance after a careful inspection of the Boilers
COVERING ALL LOSS OR DAMAGE TO

Boilers, Buildings and Machinery,

ARISING FROM

STEAM BOILER EXPLOSIONS.

The Business of the Company includes all kinds of STEAM BOILERS

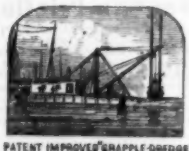
Full information concerning the plan of the Company's operations can be obtained at the
COMPANY'S OFFICE, HARTFORD, CONN.,
or at any Agency.

J. M. ALLEN, Pres. W. B. FRANKLIN, Vice-Pres. J. B. PIERCE, Sec.

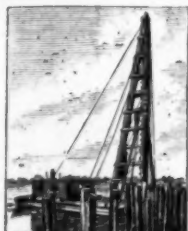
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PATENT IMPROVED HOPPER DREDGE.



SEAM'S PATENT STEAM POWER PILE-DRIVER.



IMPROVED HOPPER DREDGE.

BUILDERS OF STEAM DREDGING MACHINES,
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CONTRACTORS FOR

IMPROVING RIVERS AND HARBORS,
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Offices, No. 10 South Delaware Ave., Philad'a.

Machinery, &c.



REPORT OF JUDGES

In Department V, Group 3, at the 44th
Exhibition of theAMERICAN INSTITUTE,
Held in the City of New York, Oct., 1875.No. 318, Drawing, Drop &
Punching Presses.THE STILES & PARKER PRESS CO.,
Of Middletown, Conn.

The machinery exhibited by these makers is of a
character that calls for special commendation. In
addition to their well known punching presses, to
which a new feature has been added in a press ad-
justable to an inclination for discharging work left
above the die, there are exhibited by them a com-
bined punch and shears, a drawing or blanking press,
and a drop.

In all these there is shown the highest mechanical
culture, applied to meet every practical requirement,
to avoid every practical difficulty, and to enlarge the
range of application of the machines, by devices
which are at once simple, elegant, and effective.

Your committee would unhesitatingly recommend
for this exhibition the "Medal of Progress," but
find such award debarred by the rule of the Institute,
forbidding such award unless a Silver Medal has
been previously awarded. We, therefore, respect-
fully recommend the award of a Silver Medal.

Silver Medal Awarded.
A true copy from the Report on file.
JOHN W. CHAMBERS, Sec'y.

AQUOMETER
Steam Pump.Highest Premium awarded by
Franklin Institute, 1874,
For Simplicity, Economy of
Construction & Efficiency.An absolutely Durable, Cheap, Efficient and Eco-
nomical Steam Pump. Requires no special care or
lubricating. Warranted. Address for circular,AQUOMETER STEAM PUMP CO.,
10 South Dela. Avenue, Philadelphia,LE COUNT'S
Pat. Machinists' Tools.REDUCED PRICES.
Set Iron Dogs, 1/4 to 2 in. \$ 5.00
" Steel " 1/4 to 2 in. 12.00
" " 3/4 to 3 in. 13.00
" " 3/4 to 4 in. 13.00Iron and Steel Clamps, Die
Dogs, Clamp Dogs,
Vise Clamps, Expanding Mandrels, &c.Send for latest Price Lists to
C. W. LE COUNT,
South Norwalk, Conn.The Frazer Axle Grease
and Lubricator.A pure Lubricator, free from water, gum or sedi-
ment. The best article made for Wagons, Open
Journals, Cog Wheels, Rollers and wherever
a Solid Lubricator or Grease can be applied.
Put up in Boxes, Kegs and Barrels. For prices see
New York Price List in this paper.
Established 10 years.Frazer Lubricator Company,
104 Maiden Lane, New York.Get Binders
FOR THE IRON AGE.We have made arrangements to furnish Koenig's
PATENT BINDER, which we think altogether the best
before the public, to our subscribers at the following
very low rates—about the wholesale prices by the
dozen.

Half Cloth \$1.00 each.
(Cloth Back and Corners, with Mo-
rocco Paper Sides—a good, ser-
viceable Binder.)

Full Cloth 150 "

Half Roan 175 "

(Roan Back; Cloth Sides.)

Half Morocco 200 "

(Morocco Back and Corners; Cloth Sides.)

The above are all in black, which is the most ser-
viceable color, with the exception of the Half Mo-
rocco, which are put up in a number of handsome
shades. The name of the paper is stamped in gold
on either side, and each Binder is furnished with
loops by which it can be hung up against the wall as
newspaper files are usually disposed of.

TUBAL SMELTING WORKS, 760 South Broad Street, PHILADELPHIA. PAUL S. REEVES, MANUFACTURER OF ANTI-FRICTION METALS.

XXX Genuine.....	40c	C.....	90c
XX.....	35c	D.....	15c
X.....	30c	E.....	10c
A.....	25c	F.....	10c

"Note."—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

BRASS CASTINGS, 21 to 25c. INGOT BRASS, 19 to 25c. BRASS TURNINGS AND OLD METALS WANTED.

ESTABLISHED 1842.

WM. & HARVEY ROWLAND, PHILADELPHIA,

P. O. Address: Frankford, Philad'a. MANUFACTURERS OF ALL KINDS OF

Elliptic, Platform AND C Springs,

MADE EXCLUSIVELY FROM

SWEDISH STOCK, OIL-TEMPERED and WARRANTED.

Swedish Tire, Toe, Blister and Spring Steel.

CAST SPRING AND PLOW STEEL.
CAST SHOVEL, HOE AND MACHINERY STEEL.

OXFORD TIRE, SLEIGH, TIRE AND SPRING STEEL.
BESSEMER SHOVEL AND PLOW STEEL.
BESSEMER MACHINERY AND CULTIVATOR STEEL.

RE-ROLLED NORWAY SHAPES.
NORWAY NAIL RODS ROLLED AND SLIT FROM SUPERIOR BRANDS.

STEARNS' IMPROVED



We wish to call your attention to the following advantages of our new Improved Screw Clamp: First, being heavier than any other, and having the stock so proportioned as to give the most strength for the amount of weight. Second, the style of the thread on the thumb screw being strongest made, and so fine that it can be easily tightened without the use of a wrench. Universally used and approved by all wood-workers. Warranted to be made of the best refined Malleable Iron. Your sample order is respectfully solicited. Send for Catalogue of 1875, and supplement of 1876, and reduced price list to

GEO. N. STEARNS & CO., Syracuse, N. Y.

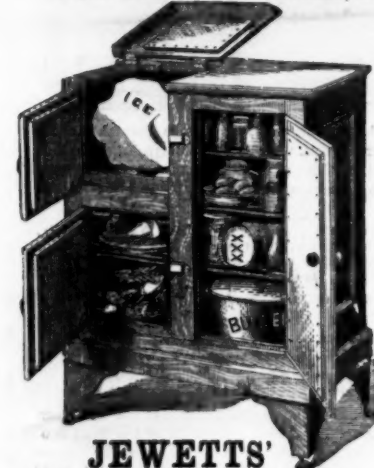
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MANUFACTURERS OF



Also JAPANNED & BRIGHT BRASS
BIRD CAGES,

Water Coolers, Water Filters, Bathing Apparatus, Tea Trays, &c., &c.



Jewett's Patent
Filter
WITH
PORCELAIN
LINED
COOLER.

Acknowledged the
only Complete Filter
and Cooler in the
world.

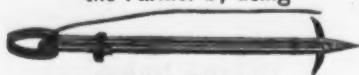
Hardware, House-furnishing and Crochery dealers
can find no more valuable article, as this Filter is per-
fect in its work of purifying water of every kind,
attractive in appearance, &c., &c.
Send for illustrated circular.

Manufactured only by
JOHN C. JEWETT & SONS,
Buffalo, New York.

JEWETT'S
Buffalo Refrigerators.

Send for copy of our Splendid Centennial Catalogue.

NEW TIME TABLE. Great Reduction in Time and Labor to the Farmer by using



Nellis' Original HARPOON HORSE HAY FORK,

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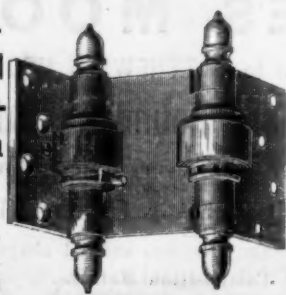
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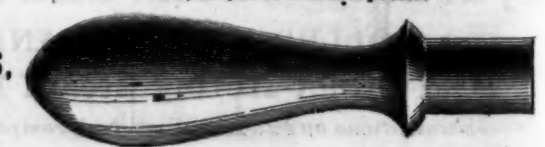
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